JOURNAL

OF

ECONOMIC ENTOMOLOGY

OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

VOL. 4 FEBRUARY, 1911 No. 1

Proceedings of the Twenty-Third Annual Meeting of the American Association of Economic Entomologists

The twenty-third annual meeting of the American Association of Economic Entomologists was held in the School of Mines Building of the University of Minnesota, Minneapolis, Minn., December 28, 1910, and on the following day the sessions were held in the rooms of the State Entomologist of Minnesota, on the grounds of the State Agricultural College.

Part I of this report contains the business proceedings, and the addresses, papers and discussions will be found in Part II.

PART I

The meeting was called to order by President E. D. Sanderson at 10 a. m. on Wednesday, December 28. The average attendance at the sessions was fifty members and visitors. The following members were present:

E. A. Back, Blacksburg, Va.; G. M. Bentley, Knoxville, Tenn.; Lawrence Bruner, Lincoln, Neb.; A. F. Burgess, Melrose Highlands, Mass.; E. C. Cotton, Knoxville, Tenn.; J. J. Davis, Chicago, Ill.; G. A. Dean, Manhattan, Kansas; E. B. Engle, Harrisburg, Pa.; H. A. Gossard, Wooster, Ohio; T. J. Headlee, Manhattan, Kan.; L. O. Howard, Washington, D. C.; S. J. Hunter, Lawrence, Kan.; F. B. Lowe, Detroit, Mich.; O. W. Oestlund, Minneapolis, Minn.; W. C. O'Kane, Durham, N. H.; Herbert Osborn, Columbus, Ohio; H. T. Osborn, Wellington, Kan.; Edith M. Patch, Orono, Me.; W. J. Price, Jr., Blacksburg, Va.; A. G. Ruggles, St. Anthony Park, Minn.; C. E. Sanborn, Stillwater, Okla.; J. G. Sanders, Madison, Wis.; E. D. Sanderson, Morgantown, W. Va.; G. D. Shafer, East Lansing, Mich.; N. E. Shaw, Columbus, Ohio; J. B. Smith, New Brunswick, N. J.; H. E. Summers, Ames, Iowa; M. H. Swenk, Lincoln, Neb.; T. B. Symons, College Park, Md.; T. D. Urbahns, St. Anthony Park, Minn.; R. A. Vickery, Washington, D. C.; F. L. Washburn, St. Anthony Park, Minn.; R. L. Webster, Ames, Iowa, and L. H. Worthley, Boston, Mass.

PRESIDENT SANDERSON: The first business on the program is the report of the secretary, by Mr. A. F. Burgess.

REPORT OF THE SECRETARY

At the close of the year 1909, the membership of the Association was made up as follows: Active 118, associate 124 and foreign 46. At the Boston meeting thirteen associate and one foreign member were transferred to the active list and thirty-six associate and three foreign members were elected. One active member resigned at that meeting and one active and one associate member have died during the year which is just closing. At the last meeting the secretary was instructed to notify nine active and ten associate members, who were in arrears for dues for three years, that unless payment was made their names would be dropped from the roll. This has been done and four active and eight associate members have been dropped. The present membership is 126 active, 138 associate and 48 foreign members. A net increase of 24.

From the number of applications for membership received it is evident that a moderate growth in membership will result at this meeting.

The Association has lost through death Mr. G. W. Kirkaldy, the well-known Hemipterist and assistant entomologist to the Hawaiian Sugar Planters' Experiment Station at Honolulu and Mr. J. A. West, who for several years had been assistant to the state entomologist of Illinois.

One of the most difficult features of arranging for the annual meeting is to make up the program in such a manner that the members who prepare papers will have a reasonable amount of time to present them and so that important discussions will not be curtailed so that little of value will result. For a number of years it has been customary to hold sessions for two days and when this practice commenced the number of papers presented afforded sufficient time for them and the transaction of the business of the Association. During the last few years the number of titles submitted is far too great for a meeting of two days and it appears that the time has now arrived when only a limited number of papers can be accepted for the program or the number of sessions of the meeting must be extended so that all members who present papers or wish to attend the meetings will be assured of a proper hearing.

FINANCIAL STATEMENT

Balance on hand December 28, 1909		$121.19
By amount received for dues, 1910		191.50
To stenographic report 1909 meeting	$15.00	
stamps and stamped envelopes	41.23	
printing	32.97	
photo and express	2.85	
supplies	1.00	
telegraph and express charges	3.59	
clerical work, secretary's office	18.00	
compensation of secretary	50.00	
	164.64	
Balance in treasury December 24, 1910	148.05	
	$312.69	$312.69

Respectfully submitted,

A. F. BURGESS,
Secretary.

PRESIDENT SANDERSON: What is your pleasure as regards the report of the secretary?

Moved and seconded that it be adopted.

SECRETARY BURGESS: I would request that the motion be amended so that the financial part of the report can be referred to the auditing committee.

By vote of the Association the amended motion was adopted.

PRESIDENT SANDERSON: The report of the committee on the matter of control of imported nursery stock is now in order. Mr. Symons, are you ready to report?

MR. SYMONS: This is not on the program but I would like to have it taken up later.

PRESIDENT SANDERSON: The next business is the report of the committee on testing proprietary insecticides. In behalf of this committee I will say that no meeting has been held. A report was made and published in the JOURNAL after the passage of the National Insecticide Law last spring. Since that time no work has been done. I believe there is a field for an insecticide committee, but would like to see the present one discharged and a new committee nominated. There is no further report to make at the present time.

MR. LOWE: Concerning insecticides, has this standing committee had any insecticides submitted for tests?

PRESIDENT SANDERSON: Not this past year. Two years ago some insecticides were submitted to us, and the committee at that time made its report.

MR. LOWE: I allude to the recommendation of the standing committee on insecticides, that the insecticides be first tested by the manufacturers and then submitted for corroboration. In regard to the insecticide law, I have looked into that very carefully, and there are several things I notice, in connection with the law that are liable to come up some time.

PRESIDENT SANDERSON: I would say, that this should properly be taken up with the United States Bureau of Chemistry.

President Sanderson next presented the report of the Executive Committee.

REPORT OF THE EXECUTIVE COMMITTEE

December 28, 1910.

To the American Association of Economic Entomologists:

GENTLEMEN, Your Executive Committee has been unable to hold a meeting, but has conducted its work by correspondence and begs to present the following unanimous report:

1. Your committee has voted the necessary expense for clerical help for the secretary and an honorarium of $50 for 1910, as authorized by the last meeting. Your

committee feels that the financial condition of the Association and the duties devolving upon the secretary both warrant such slight remuneration. We would recommend that it be the future policy of the society to pay the expenses of the secretary to the annual meeting provided his expenses are not paid by the institution by which he is employed, and that in lieu of such expenses or in addition to them, the executive committee be empowered to vote the secretary such annual honorarium as the financial condition of the Association may warrant.

2. Your committee recommends the establishment of a standing committee on "Entomological Investigations." It is contemplated that it would be the duty of said committee to secure reports from the heads of all entomological departments represented in the Association, as to the work in progress and the work contemplated for the following year. Such reports would be gathered during the late fall and a summary published in the December issue of the JOURNAL OF ECONOMIC ENTOMOLOGY or presented at the annual meeting, so that the information so received would furnish the basis of personal conferences between different workers along similar lines at the annual meeting. As indicative of the work of such a committee we have secured a report along these lines through the coöperation of Dr. T. J. Headlee which will be presented at this meeting.

3. Your committee recommends that the incoming executive committee be instructed to submit an amendment to Article III of the By-Laws as required by Article 5 of the By-Laws, so that Article III shall provide that the annual dues of active members be $2 and of associate members $1.50, the same to include a subscription to the JOURNAL OF ECONOMIC ENTOMOLOGY, and that foreign members be charged no dues, but that they be charged $1.50 as subscription for the JOURNAL OF ECONOMIC ENTOMOLOGY if they desire it.

This proposed amendment anticipates that the Journal of Economic Entomology Publishing Company, will elect the secretary of the Association of Economic Entomologists as secretary-treasurer, *ex officio* business manager, and would provide certain compensation for that official by the Publishing Company. It seem to your committee that an informal discussion of the proposed arrangement might be advisable at the present meeting, so that the plan might be fully understood and carefully considered during the coming year.

Respectfully submitted,

E. D. SANDERSON, *President.*
H. T. FERNALD, *First Vice-President.*
P. J. PARROTT, *Second Vice-President.*
A. F. BURGESS, *Secretary.*

PRESIDENT SANDERSON: What is your pleasure in regard to this report, will you act on it now or, take it up later?

By general consent action on the report was postponed until the final business session.

PRESIDENT SANDERSON: We will next listen to the report of the Committee on Affiliation by Mr. Bruner.

MR. BRUNER: This report was made by Doctor Hopkins, as I was unable to be present at the Washington meeting.

REPORT OF THE COMMITTEE ON AFFILIATION OF THE AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

Prepared and presented at the joint meeting of Committees, November 15, 1910, by A. D. Hopkins.

The American Association of Economic Entomologists has given the matter of affiliation considerable attention. In the proceedings of the meeting held at Baltimore in December, 1908, about five pages are devoted to reports of committees and to discussions relating to the matter.

A committee was appointed in 1908 to attend the meeting of the Society for the Promotion of Agricultural Science, held that year at Washington, D. C. Two members of the committee were present and a report made to the Society at its regular session in December of the same year that nothing definite had been accomplished. After a discussion of the matter, the president appointed Lawrence Bruner, A. D. Hopkins, and A. F. Burgess a committee to confer with other committees on affiliation and report at the next meeting; also to present a plan of action for the consideration of the Association before final adjournment. The following plan was presented:

See p. 24, JOURNAL OF ECONOMIC ENTOMOLOGY, Vol. II, No. 1, February, 1909, p. 24. (Letter Professor Bruner, October 26, quoted in part.)

In expressing my opinion as a member of the committee, it is evident that in order to promote in the best way these common objects and social and business interests, there is special need of some form of affiliation of the various societies in North America which have for their objects the advancement of agriculture through scientific research. Among the needs to be met by affiliation and coöperation, the following may be mentioned:

(a) Economy and efficiency in conducting the special and general sessions; (b) economy and efficiency in publications; (c) economy in membership fees and annual dues.

In conducting the meetings provisions could be made: 1. For securing the best facilities for independent and joint sessions of the various societies and their committees.

2. For classifying the subjects of papers to be presented, and assigning them to the programs of a special society, or the joint programs of two or more societies where they will be of interest to the greatest number of the members in attendance.

3. For the selection of special subjects of the broadest interest and assigning them to the general session of the affiliated societies for discussion.

In regard to economy and efficiency in publications, there is decided need of economy in the aggregate cost of publications issued by the various societies, as there is also of more efficiency in such publications to meet the requirements of the members for classified and condensed information issued in the most convenient and available form for the busy investigator and student.

It is believed that through affiliation and proper coöperation and a common place of publication, with a paid editor to coöperate with the publication committees of the various societies, the cost to the individual members of desirable published matter could be reduced fifty per cent., and that efficiency in such publications could be greatly increased.

As to economy in membership fees and annual dues, there is special need of economy in the aggregate amount of money paid by the scientist to secure the social,

intellectual, and other benefits to be derived from the various organizations relating to the subjects in which he has a special or general interest.

These expenditures consist in membership fees, annual dues, special assessments for social functions, railroad travel, hotel bills, etc., amounting in the aggregate to a considerable sum, and often much larger than the investigators who are giving their time and energies to public service at moderate salaries feel that they can afford.

It is believed that through affiliation and the transaction of the business affairs by a representative permanent committee, the aggregate amount heretofore paid in membership fees and annual dues per individual member can be reduced fifty per cent. or more, and that the facilities for acquiring general and personal benefits and for the advancement of the various specific and general objects of the societies can be increased very materially.

Indeed, there appears to be a feeling among the members of scientific societies generally that a more progressive and economical method of conducting the business of the societies should be adopted.

A. D. HOPKINS.

November 14, 1910.

The following general plan of organization is submitted as an appendix to our report:

A PROPOSED AFFILIATION OF SOCIETIES ORGANIZED FOR THE ADVANCEMENT OF AGRICULTURAL SCIENCE

RESOLUTION AND AGREEMENT

The authorized representatives of the associations and societies relating to agricultural science present at a meeting held in Washington, D. C., November 15, adopted the following resolution and constitution:

Resolved, That in order to promote common objects and interests there is special need of an affiliation of the various societies in North America which have for their objects the advancement of agriculture through scientific research;

That, therefore, the undersigned representatives of the Association of American Agricultural Colleges and Experiment Stations, American Association of Economic Entomologists, American Association of Farmers' Institute Workers, American Breeders' Association, American Phytopathological Society, American Society of Agronomy, American Society of Animal Nutrition, Association of Dairy Instructors, Association of Horticultural Inspectors, Association of Official Agricultural Chemists, Society for Horticultural Science, and Society for the Promotion of Agricultural Science hereby agree to affiliate under the following constitution, *subject to ratification at the first regular session held by the societies mentioned subsequent to this date.*

[Signed on behalf of the American Association of Economic Entomologists by A. D. Hopkins.]

CONSTITUTION

ARTICLE I. Name

The name of this organization shall be the Affiliated Societies of Agricultural Science.

ARTICLE II. Purpose

The purpose of the affiliation shall be to promote the common interests of the adhering societies, arrange periodically for a common place and time of meeting, promote economy and efficiency in publications, and otherwise to encourage coöperation in the advancement of agriculture through scientific research.

ARTICLE III. Membership

The organization shall consist of national societies which have for their prime object the advancement of agriculture. The societies mentioned in the accompanying resolution shall be charter members. Additional societies may be admitted at any general meeting of the Affiliated Societies.

ARTICLE IV. Organization

The general business of the organization shall be in charge of a Council, to consist of one member elected biennially by each adhering society.

The officers of the Council shall be a president, a vice-president, a secretary, and a treasurer, who shall serve for six months after their successors are elected. These officers shall constitute the officers of the organization.

ARTICLE V. Meetings

A general meeting of the Affiliated Societies shall be held at least biennially, at a time and place to be determined by the Council. Any adhering society may hold meetings at such times and places as it may select, but so far as practicable all should meet together biennially.

ARTICLE VI. Autonomy

Each society shall retain its organization, and shall have entire control of the election of its members and officers and all other matters not specifically delegated by it to the Council of the Affiliated Societies.

ARTICLE VII. Annual Dues

Each society upon becoming a member of the organization shall pay to the treasurer of the Council a *pro rata* sum not to exceed one dollar for each of its members, and a similar amount thereafter annually, the amount in each case to be fixed by the Council. The fiscal year of the Affiliated Societies shall coincide with the calendar year.

ARTICLE VIII. Publications

The Proceedings of the various societies may be issued individually, but all should conform to a uniform style of page, paper and type, in order that they may constitute uniform parts of a set of Transactions of the Affiliated Societies.

The Council may, upon the approval of the adhering societies, superintend the publication of their Proceedings and employ a general editor to coöperate with the editors of the various societies in securing uniformity, economy, and efficiency.

The Council may arrange for the periodical publication of a journal of agricultural science, to contain reports in abstract of the meetings of the societies, brief notices, reviews, and contributions of general interest to the members of the Affiliated Societies, and for the interchange of ideas on important problems of the day relating to agricultural science, this journal to be issued to members at a subscription price to be fixed by the Council.

ARTICLE IX. Amendments

Amendments to this constitution may be made at any general session of the affiliation upon the recommendation of the Council, provided that sixty days' notice of the proposed amendments has been given to the president and secretary of the adhering societies.

ARTICLE X. By-Laws

The Council shall formulate and adopt a set of by-laws to govern its actions under this constitution.

MR. J. B. SMITH: I would like to move that this report be considered at the same time with the report of the Executive Committee. One

reason I make the suggestion is that I am acquainted with the character of the report, and the question of publication is more or less connected with this, so that these two subjects should be considered together. I move that action on this be deferred until later.

The motion prevailed and the consideration of the report was deferred until the next business session.

PRESIDENT SANDERSON: We will now hear the report of the Committee on Nomenclature by Professor Osborn.

MR. HERBERT OSBORN: The committee has no list of names to submit for adoption at this meeting. Few common names of insects have been received during the year but it is the expectation of the committee to submit a list at the next annual meeting.

Voted that the report be accepted.

PRESIDENT SANDERSON: Are there other reports?

SECRETARY BURGESS: Mr. President, I have received quite a number of letters from members who are unable to be present, many of those who have papers on the program are not here, and have forwarded the papers to me. Among them might be mentioned Professor Cooley of Montana. Miss Murtfelt of Kirkwood, Mo., has also sent a short letter and a paper which she has prepared, and states that owing to poor health she is unable to be here. I have papers from Dr. H. T. Fernald and Professor Comstock, which go with the symposium on teaching entomology, and a paper from Mr. Norman Criddle, Treesbank, Manitoba; a letter from Doctor Hewitt, the Dominion Entomologist of Canada, saying he is unable to be present, owing to the fact that he has been traveling over the Dominion for two or three months, and business matters force him to be in another portion of the country at this time; a letter from Doctor Bethune regretting his inability to be present and a short paper from F. W. Urich. Several of the papers are not on the program, for the reason that they came in after the program was printed. I have a title from Charles T. McClintock and Mr. Lowe on "Demonstration of Methods of Testing Ingestion and Contact Insecticides."

At the last meeting of the Association resolutions were passed in regard to the death of members who had passed away during the year previous, and after the meetings were concluded a copy was sent to each one of the families. I received a letter from Mrs. Guilbeau stating her deep appreciation of the action taken.

There is one other matter I think of at this time: At the last meeting a resolution was passed providing for official buttons. This has been done, and buttons have been prepared for the meeting. The idea is to give them out on the same basis that the buttons are given out by the American Association for the Advancement of Science, that is, upon

the payment of dues. The program has been prepared, and in the back of each program has been printed a list of members, and the number of the button which is issued corresponds with the number of the member on the list. Unfortunately, when I took this matter up with the printer, he misunderstood me, and the programs were all printed with covers. I only intended to have covers on the programs for the members, and then have a certain number struck off without covers to be given out promiscuously.

MR. HERBERT OSBORN: I would like to make a motion that the secretary send our greetings to Miss Murtfelt. She is very much interested in entomology, and I know she watches the work of this Association very carefully.

SECRETARY BURGESS: I would like to second that motion. I had the pleasure of visiting Miss Murtfelt, and passed a very pleasant afternoon in her home, and since that time, owing to the fact that I have been secretary, I have had a number of letters from her. She is deeply interested in entomology, and if this meeting had been held here in the summer I am very sure she would have attended. Motion carried.

PRESIDENT SANDERSON: It has been planned that we hold a session at the Agricultural College on Thursday, and inasmuch as that is perhaps as good an opportunity as we shall have to see the college and the equipment of the state entomologist there, perhaps it would be well for us to accept the invitation tendered us.

A MEMBER: I move that when we adjourn this afternoon that it be to meet at the Agricultural College. Carried.

SECRETARY BURGESS: I would like to ask one question about the program. We have a very full program, and a good many papers have been sent in by parties unable to be present. There are also a few papers, which are not on the program. I think it ought to be arranged in some way so that we shall know just what ones are going to be presented.

A MEMBER: I move that the papers whose authors are not present be moved to the end of the program. Carried.

MR. HEADLEE: It has been suggested that it would be highly desirable for the Horticultural Inspectors to become directly affiliated with this Association, and that, to that end, a committee of this Association be appointed to confer with the committee on organization of the Association of Horticultural Inspectors.

A MEMBER: I move that such a committee be appointed. Carried.

MR. WASHBURN: I should like to ask if anything definite was done at the Washington meeting in this connection.

MR. SYMONS: I would say that the report of the Washington meeting was similar to the one presented by Professor Bruner.

MR. SUMMERS: In general I am in favor of affiliation where possible, but it seems as though all the affiliation necessary in the case of these societies is merely to avoid conflict. The Association of Horticultural Inspectors cannot combine with this Association because its members are not made by the election of the association, and I do not see any need of affiliation.

MR. J. B. SMITH: There is one other point to be taken into consideration in this connection: Matters which were of particular interest to the Horticultural Inspectors were brought into our meeting and there was so much discussion that it took up too much time. Now, that will bring all that back into the Association again, and I do not know as we want it here at the present time.

PRESIDENT SANDERSON: I might suggest, and I suppose that is the reason this matter was brought up at this time, that if there are some who favor this idea, a committee might consider this and take it up at the last session. I do not understand that it would affect our program at all.

MR. HOWARD: It seems to me we are wasting valuable time. This matter can be taken up later.

PRESIDENT SANDERSON: Is there any further business? I have appointed the following committees:

Resolutions: Messrs. Headlee, Sanders and Symons.
Nominations: Messrs. Osborn, Bruner and Gossard.
Memorial Resolutions: Messrs. Osborn and Davis.
Auditing: Messrs. O'Kane and Cotton.
Affiliation of Horticultural Inspectors: Messrs. Symons, Headlee and J. B. Smith.

President Sanderson announced that as Messrs. Quaintance and Forbes of the Membership Committee were not present at the meeting, he would appoint Messrs. J. B. Smith and Burgess to serve in their places.

In accordance with a previous arrangement the final business of the meeting was transacted at the session Wednesday afternoon, December 29.

PRESIDENT SANDERSON: The first thing on the program is a report of the Committee on Legislation by Professor Symons.

MR. SYMONS: I have no formal report to make, but will say that during the past year the committee has aimed to do everything in its power to forward the passage of the so-called Simmons bill, which has been before Congress. We were invited to appear before the Agricultural Committee last January and present our claims as to the worthiness of this bill. It seemed that the orchardists of West Virginia and other places had previously taken the matter up with the Secretary of Agriculture, and were also anxious to be heard, and it appeared that

the nurserymen likewise were there, and the rank and file of the importers of stock were present at the hearing. It developed that the nurserymen opposed the bill, particularly one section of it which gave power to the Secretary of Agriculture to quarantine against any infested section in Europe. Hearings were given these parties, but on account of the rush of business in Congress, it being toward the end of the session, the bill was not brought to a vote. I have learned that toward the close of the session an agreement was made to cut out the objectionable section—Section 8—and it was thought the measure would go through, but there seems to have been some hitch in the matter even after that, so it was promised that this bill will be taken up immediately after the holidays. As far as I know this section has not been taken out of the bill, and I would simply recommend to the Association that a committee be appointed to take up the matter energetically, as it seems the time has arrived when we should act irrespective of the nurserymen, but not necessarily be antagonistic to them, that is to say, invite their support, but at all odds, push the matter with every means at our command. I think there is a big opportunity for this Association to make a name for itself in securing this legislation.

SECRETARY BURGESS: I move the report of the committee be accepted and a committee be appointed by the chair, as suggested in the report just submitted. Carried.

MR. J. B. SMITH: I want to add just a word to what Mr. Symons has said. I was present at that hearing, and the impression that was left upon me at that time was that the nurserymen did not want a bill. They took the ground that they objected to it on account of the quarantine section, but after the department yielded to them and was ready to take out the quarantine section they began looking for other features to criticise, and I have not the slightest doubt they did not want any bill at all. I think we might just as well go ahead and look after our own interests, and let the nurserymen look out for themselves, and I would suggest that we indorse the bill as a whole, including the quarantine section. The reason is that while we as entomologists can look after our end of the problem, the matter is decidedly serious from the point of view of the plant pathologist. There are a number of plant diseases that cannot be recognized at the time of importation. Take the white pine blister rust, for instance, and other diseases which are absolutely impossible of recognition in early stages, and the only protection we have against their introduction is a rigid quarantine in sections of Europe or other countries where the disease is known, and without section 8 the bill is useless.

MR. SYMONS: I neglected to mention the great help that both

Doctor Smith and Professor Worsham gave us in presenting the entomological aspects of the case before the Agricultural Committee. In fact, I would say that Doctor Smith made a very favorable impression upon the committee.

PRESIDENT SANDERSON: As I understand it, the report of the committee made by Mr. Symons indorses the Simmons bill. I want to make that matter clear—as I understand it, the Bureau of Entomology has an understanding with the nurserymen that they will accede to the withdrawal of this section.

MR. J. B. SMITH: There is no understanding between the Department of Agriculture and the nurserymen as to that point. The department is pushing the bill with all sections intact.

PRESIDENT SANDERSON: I want to make that matter perfectly clear and have the Association vote on it, because if we instruct the committee to push the matter as it now stands, our committee would feel some hesitancy unless they had a full understanding, and I hope the Association fully understands that part of it, and will vote advisedly upon it.

MR. SYMONS: I would like to see the Association give the matter thorough consideration. Personally, I would rather see a bill without that section than to see no bill at all, but if the Association feels it must stand for that section, irrespective of consequences, I would agree to it. The question is whether the Association would not rather see a bill without that section than to see no bill at all. I believe from an entomological standpoint at least, that it will make a start toward good legislation.

MR. S. J. HUNTER: If my memory serves me right, at our meeting in Boston, an arrangement was finally decided upon.

PRESIDENT SANDERSON: That was in the Association of Horticultural Inspectors, was it not?

MR. S. J. HUNTER: Yes, the Horticultural Inspectors. They received from the committee of the National Nurserymen's Association a protest against what we thought was in conformity with their wishes, and what we thought they agreed to.

PRESIDENT SANDERSON: I might make a suggestion for the consideration of the Association, and that is, that I believe this Association could afford to allow this committee a small amount of money for the purpose of carrying on necessary correspondence during the next month in getting the horticulturists at work, and rousing public sentiment in this matter. I have an idea that $25 would cover postage and necessary expenses of the work.

MR. SYMONS: Would this Association be willing to instruct the committee to use its discretion in securing the passage of the Simmons bill?

MR. HERBERT OSBORN: I move that the Committee on Legislation be authorized to use its discretion in the matter of securing legislation, agreeing as closely as possible with the Simmons bill. Motion carried.

PRESIDENT SANDERSON: I will appoint on that committee Messrs. Symons, Worsham and J. B. Smith.

SECRETARY BURGESS: I think the president has mentioned the matter of allowing a small amount of expense money for postage, etc., and it seems to me if that matter is to be taken up at all it should be settled at this time.

MR. HEADLEE: I desire to move that a sum of $25, or such part thereof as is necessary, be appropriated from the treasury of this Association to be used for the purpose just mentioned. Motion carried.

PRESIDENT SANDERSON: We will now take up the report of the Committee on Resolutions.

REPORT OF COMMITTEE ON RESOLUTIONS

Ladies and Gentlemen of the American Association of Economic Entomologists:

Your committee desires to present the following report:

WHEREAS, There now exists a great lack of properly trained men for the work in economic entomology in the country at large, be it

Resolved, By the Association, that universities and agricultural colleges within whose province it naturally falls to supply this need, be urged to provide adequate facilities for the thorough training of capable men for the profession of economic entomology.

WHEREAS, The recent importation of brown-tail and gypsy moths on nursery stock from abroad has most forcibly demonstrated the imperative need of an adequate national inspection law, and whereas, the Simmons bill now before Congress proposes a sufficient and satisfactory law, be it

Resolved, That this Association by every means in its power, urge upon Congress the necessity for passing this bill without unnecessary delay or change.

WHEREAS, The University of Minnesota, through Dean Appleby and the Staff of the School of Mines, and through the School of Agriculture, has most courteously provided this Association with highly satisfactory accommodations, be it

Resolved, That the Association's most sincere thanks be extended to the proper authorities.

WHEREAS, It is undoubtedly due primarily to the efforts of Prof. F. L. Washburn that the Association has experienced such delightful treatment during its stay in Minneapolis, both at the University and in the city, be it

Resolved, That the hearty thanks of the Association be extended to him for his very thoughtful and kindly efforts in its behalf.

Respectfully submitted,

T. J. HEADLEE,
THOMAS B. SYMONS,
J. G. SANDERS,
Committee.

Voted that the report be accepted.

PRESIDENT SANDERSON: We will next hear the report of the Auditing Committee by Mr. O'Kane.

REPORT OF THE AUDITING COMMITTEE

The committee respectfully reports that it has examined the books of the secretary and has found them correct.

W. C. O'KANE,
E. C. COTTON,
Committee.

PRESIDENT SANDERSON: The next report is that of the Committee on Memorial Resolutions, by Professor Osborn.

REPORT OF THE COMMITTEE ON MEMORIAL RESOLUTIONS

In the death of Mr. G. W. KIRKALDY the American Association of Economic Entomologists has lost one of its most brilliant and active members and it is with deep sense of its loss that it now records its admiration of the man and his work.

Mr. KIRKALDY was eminent as a systematist and had contributed largely to the growth of knowledge, especially in the group Hemiptera. Especially in his recent Catalogue of Heteroptera, unfortunately complete for only part of the group, he has placed workers in entomology permanently in his debt. While still young and with prospect of a most useful career for the future, the work he had already accomplished will stand as an enduring testimony of his ability and industry.

In the death of Mr. J. A. WEST the Association was lost one of its younger and valued members. He was generally recognized as a scientist of exceptional ability and by those who knew him more intimately he was appreciated as a painstaking and energetic worker. His ability was also recognized by the progressive agriculturists in his own and many other states where he was so often called for addresses on entomology.

Resolved, That these resolutions be placed in the published records of this meeting of the Association and that copies be transmitted to the families of the deceased.

HERBERT OSBORN,
JOHN J. DAVIS,
Committee.

Voted that the report of the committee be accepted and the recommendations adopted.

PRESIDENT SANDERSON: The report of the Committee on Nominations is next in order.

REPORT OF THE COMMITTEE ON NOMINATIONS

Your Committee on Nominations begs leave to submit the following report:

For President, F. L. WASHBURN of Minnesota.

First Vice-President, E. D. BALL of Utah.

Second Vice-President, R. H. PETTIT of Michigan.

Member of Committee on Nomenclature, A. L. QUAINTANCE.

Members of Council, A. A. A. S., { H. E. SUMMERS, E. D. SANDERSON.

Members of Advisory Board, JOURNAL OF ECONOMIC ENTOMOLOGY, L. O. HOWARD, S. A. FORBES.

Respectfully submitted,

HERBERT OSBORN,
LAWRENCE BRUNER,
H. A. GOSSARD,
Committee.

It was moved and seconded that the secretary cast a ballot for the election of the members nominated. The ballot was cast and the members nominated were elected.

PRESIDENT SANDERSON: We will now take up the report of the Committee on Membership.

REPORT OF THE COMMITTEE ON MEMBERSHIP

The Committee on Membership begs leave to submit the following report:

For foreign membership:

Dr. L. P DeBussy, Biologist of the Tobacco Growers' Association, Deli, Sumatra.

Mr. N. Kourdumoff, Opytnoe Pole, Poltava, Russia.

For advancement from associate to active membership:

Back, E. A., Blacksburg, Va.
Barber, H. S., Washington, D. C.
Foster, S. W., Washington, D. C.
Gahan, A. B., College Park, Md.
Johannsen, O. A., Orono, Me.
Jones, P. R., Washington, D. C.
Kelly, E. O. G., Washington, D. C.
O'Kane, W. C., Durham, N. H.

For associate membership:

Babcock, C. G., College Park, Md.
Cory, E. N., College Park, Md.
Criddle, Norman, Treesbank, Manitoba, Can.
Culver, J. J., Melrose Highlands, Mass.
Douglass, B. W., Indianapolis, Ind.
Gill, J. B., Washington, D. C.
Hartzell, F. Z., Geneva, N. Y.
Hoff, E. P., Logan, Utah.
Holloway, T. E., Brownsville, Tex.
McGregor, E. A., Dallas, Tex.

Oestlund, O. W., Minneapolis, Minn.
Osborn, H. T., Wellington, Kan.
Pinkus, Harry, Dallas, Tex.
Tothill, J. D., Melrose Highlands, Mass.
Winslow, R. M., Victoria, British Columbia, Can.
Wolcott, G. N., Dallas, Tex.

Two active and two associate members are in arrears for dues for three years. It is recommended that the secretary notify them of their delinquency, and if in three months thereafter the dues have not been paid, that they be dropped from the roll.

Charles W. Hargitt and C. V. Piper have voluntarily withdrawn during the past year.

Respectfully submitted,

H. E. SUMMERS,
J. B. SMITH,
A. F. BURGESS,
Committee.

By vote of the Association the report was accepted and the recommendations adopted.

SECRETARY BURGESS: In regard to the report just presented I would like to say that it would be of advantage to a great many of the younger men in the Association if lists of their publications were filed with the Membership Committee during the year, so that the committee would have an opportunity to go over the lists and know what the members are doing and be able to form a better judgment of their work.

PRESIDENT SANDERSON: We will next hear the report of the committee on affiliation of the Horticultural Inspectors with this Association.

MR. SYMONS: I will simply report that progress has been made looking toward affiliation with the Inspectors, but it will be necessary to consider the matter at the Inspectors' meeting.

PRESIDENT SANDERSON: The report of the committee on the affiliation of the societies interested in agricultural science will be considered.

MR. HEADLEE: Would it be out of place to ask for a statement of the advantages of this affiliation?

PRESIDENT SANDERSON: Can Mr. Bruner inform us what the advantages of affiliation to this Association will be?

MR. BRUNER: I can not, because I can see no advantages.

MR. HERBERT OSBORN: I move that the matter be laid on the table and the committee discharged.

MR. SYMONS: I should like to hear Doctor Smith say a few words on this matter, not that I have any partisan views whatever, but I believe the idea was that affiliation of all these associations would be an advantage to this Association, but from the standpoint of economy, where we have to pay to become a member of this affiliation it does at first sight seem an embarrassment to this Association. Those who at-

tended the meeting of the committee were not in a position to pledge themselves to anything, and this report does not pledge any one, but it did seem to those assembled that it was a move in the right direction, and it was referred back to the Association in the hope that the matter would be discussed. I simply make this statement for I felt then and I feel now that if these associations can do anything toward the promotion of agricultural science we should consider it in a safe and sane way.

Mr. J. B. SMITH: In view of the fact that Mr. Symons has brought my name into the matter—I represented the Horticultural Inspectors and took some part in the discussion—I wish to say that one of the strongest advocates for affiliation was the one representative from the Association of Economic Entomologists. The man who made the strongest arguments in favor of affiliation, was the representative from this body, Mr. Hopkins, and he practically drafted the constitution, so the action proposed is a direct rebuke to our representative at this meeting. He presented arguments in favor of affiliation somewhat in this way: The members of the Association of Economic Entomologists are largely in official positions, largely teachers in agricultural institutions, and interested in a general way in the advancement of agricultural science. The body that meets in Washington every other year, which represents all the agricultural colleges and experiment stations, the Association of Agricultural Colleges and Experiment Stations is represented by their presidents and directors. Nevertheless, there are a number of other associations that meet at the same time in connection with them, and it would seem to be good policy for all bodies that are in any way connected with agricultural colleges and experiment stations to meet at least once in two years together. There was no suggestion that the autonomy of the Association or Society should be interfered with. It was deemed wise, in order to retain the connection between these bodies, to have a meeting once in two years, and that the meetings should always be held in Washington; that one year we should meet in Washington, and the other year anywhere we chose. Assuming that that would be the idea, it would seem to be suggested and to be believed by those who favor affiliation, that it would cheapen the matter to all the societies if that could be done, and would bring harmony into the general methods of work. Of course, the underlying idea was that there might be a publication on agriculture that would cover the entire field, with the understanding that it might be divided into different sections. Personally, I would say I am not in favor of affiliation. I am simply presenting now to this Association, which I did not represent, the argument which your representative presented with all his power and with all the effect he possibly could.

In fact Doctor Hopkins and Doctor Allen of the department really drew up this proposed constitution as it stands at the present time. My own position I think was entirely clear in this matter. I think it is only fair that before the Association takes definite action in voting for the motion as it stands, that it should know the Association is responsible.

MR. SYMONS: I wish to say that I believe, in fairness to Doctor Hopkins, that he was acting in his official capacity, and that he was carrying out, as he thought, the wishes of this Association.

SECRETARY BURGESS: Professor Bruner, Doctor Hopkins and myself were members of the committee, continued over from the time that the first work was done on affiliation. Professor Bruner and myself were unable to be present at the meeting in Washington last fall. Doctor Hopkins, of course, was at Washington, and did all the active work. Personally I had no knowledge of what the committee had done until the report was made yesterday, and I might say also that it seems to me that there are serious faults in the agreement, which would render it difficult for this Association to comply with at the present time.

MR. HERBERT OSBORN: It seems to me that as the matter stands, we could not take any favorable action, and that the question ought to be laid on the table. I am perfectly willing the committee should be continued if there is anything that could be accomplished by its retention.

PRESIDENT SANDERSON: It seems to me if that report could be accepted it would be at least a more courteous way of handling the situation, and I think the members of that committee who are here are sufficiently familiar with the situation, without any further discussion, to enable them to take the matter up. I would say I believe there is very strong sentiment in favor of this affiliation, and personally, I believe this Association cannot afford to divorce itself from the Agricultural associations of the country. If this thing is going through, and our representative has taken such an active part, we ought not to turn him down. I certainly would like to have this report placed on file with the understanding that we recognize the objections.

SECRETARY BURGESS: I think there is one clause in this resolution and agreement which bears on the matter. After enumerating the different societies which are supposed to enter into the agreement, representatives of which have signed the agreement, it states that it is subject to ratification at the first session held by the societies mentioned subsequent to this date. If we accept this report it seems to me we indorse the agreement.

PRESIDENT SANDERSON: I mean that we accept it simply as placing it on file.

MR. SYMONS: I move that the report of the committee be received and the committee continued.

PRESIDENT SANDERSON: The substitute motion that the report be received and the committee continued is carried.

We have also the report of the Executive Committee, which was laid over until this time. What is your pleasure? It might be in order for me to refresh your minds as to the suggestions of the committee. First, to adopt the policy of paying the expenses of the secretary, second to have a standing committee on entomological investigations, as suggested by the paper of Doctor Headlee, and third that the incoming executive committee submit an amendment that the dues be raised $1 to include the JOURNAL, with the understanding that the Secretary of this Association be made business manager of the publishing association in order to give the secretary as much remuneration as possible.

MR. J. B. SMITH: I move the first recommendation be adopted. Carried.

PRESIDENT SANDERSON: The second point is on the matter of a committee on entomological investigations.

MR. SYMONS: I move that the second recommendation be adopted.

MR. HEADLEE: This committee, to do its best work, ought to be representative of different sections of the country, and I doubt whether three persons is a sufficient number to make a representative committee. I think we ought to adopt this.

MR. WASHBURN: What are the duties of this committee? Why do we need such a big committee? I should suppose a very small committee would do.

MR. HEADLEE: The reason I suggest a larger committee is this: The problems in the different sections of the country vary greatly. The Southern problems are very different from the Northern, and the Western are very different in many respects from the Eastern. If we do not have a committee representing these different sections of the country, we are not going to get as good discussions of the projects under way; we are not going to get as helpful statements in pointing out the desirable and undesirable features and possibilities of change for the better. For instance, say a committee member lives in Texas, where problems are exceedingly different from problems in Minnesota—that man, owing to his familiarity with conditions in the South, ought to be able to modify the discussions submitted by the committee as a whole on southern problems in a very desirable manner. I do not see that there would be any difficulty in coming to an agreement among the members of the committee. The information could be collected and the discussions written by one member, and then sent around to the other members, and they could revise and change as they saw fit, and then return to the man who did the first writing.

MR. WASHBURN: I must confess ignorance as to just what the duties of that committee are.

MR. HEADLEE: I feel considerable hesitation in trying to answer the question. The first duty would be to gather information in regard to projects now under way. The second would be to draw these projects together and formulate them into some sort of table, possibly, that could be published in the JOURNAL, and form a basis for discussion at the regular meeting. The third duty would be to write a broad-gauged discussion of the general tendencies which these investigations showed.

PRESIDENT SANDERSON: It is suggested that the committee be of three members.

MR. SYMONS: Make it five.

PRESIDENT SANDERSON: I would say, that as contemplated originally by the Executive Committee, this proposition did not include the Bureau of Entomology. Through a misunderstanding this year, and through loss of a letter which was written by me to the bureau, we failed to have the coöperation which we feel certain we will have in the future. The proposition was that the Bureau be invited to have a representative to give an outline of the work of the Bureau exactly as this committee would secure from the different states. Motion is carried.

PRESIDENT SANDERSON: I will ask the Nominating Committee to nominate that committee as a standing committee, if they can do so, before we adjourn this afternoon. The third proposition is regarding the amendment to make the dues include the JOURNAL. This is brought up merely for discussion at this time, so that it may take the sense of the meeting.

MR. SYMONS: In order to bring the matter before the house I move that this provision be adopted, and if I can have a second, I should like to discuss it for a moment. (Motion seconded.) I would simply say I have been opposed to joining the dues and the JOURNAL for the reason that I did not think it would be best to make it necessary for the young men joining the Association to take the JOURNAL. I have learned, however, that there are only about twenty members of the Association who have not taken the JOURNAL, and it is safe to say they could all afford to take it, therefore, I take pleasure in making the motion to include the dues. It would certainly greatly simplify the work of the secretary.

PRESIDENT SANDERSON: If I may suggest; this is simply giving us a year to consider the question, and with seventy-five members present next year, they might consider it very differently. Motion was carried.

The secretary suggests that the Association may wish to take some action looking toward the matter of program for the coming year, as to how much time you wish to take.

MR. WASHBURN: This is merely a thought which occurred to me this morning: It is evident that if we can have only two days we are always going to be crowded. If we could abstract the papers, and the readers of the papers simply give results, in case there are results, and then have a few symposia, perhaps we would get over more ground than if we had the reading of all the papers in detail.

MR. COTTON: It seems to me one way we can get around this matter is to leave it to the Program Committee next year, if a large number of papers are coming in, to extend the time one day, if necessary, or to make some provision for night sessions, or it might be possible to have a joint meeting with the Entomological Society of America or the Horticultural Inspectors, and not encroach upon either one, and to that end I make a motion that the secretary be authorized to use his discretion in that matter.

PRESIDENT SANDERSON: It is moved and seconded that the matter be left to the discretion of the secretary as to the length of time occupied by our program.

SECRETARY BURGESS: Mr. President, I have always endeavored in the matter of the program to try to arrange it in such a way as to be satisfactory, fitting in with the time of the other societies that meet at the same time, and I think that policy should be continued in order that we may work in harmony with the other societies that want to meet the same week. In regard to papers, it is a very difficult matter to lay down any hard and fast rules as to what you will or won't take, and I do not think it should be the policy of this Association to discourage the sending or presentation of papers. It seems to me that if a man belongs to the Association, according to the constitution he has an equal right with any other member to present papers, or enter into discussion, and I do not think we should try to curtail that any more than is absolutely necessary, and I feel that under the motion just made we can probably make satisfactory arrangements for next year.

PRESIDENT SANDERSON: You have heard the motion that the matter be left to the secretary. What is your pleasure? Motion carried.

MR. O'KANE: There is a matter which I wish to present at this time. There are a good many of us who live a long distance from any place of meeting that may be chosen, and traveling expenses are a burden. I am advised that two years ago the Committee on Station Policy took this matter up, but did nothing about it. I should like to see the Association take some action by which the incoming Executive Committee

could take this matter up and urge the advisability of paying the expenses of entomologists to these meetings.

It was moved and seconded that the Executive Committee take the matter up with the Committee on Organization of the Association of Agricultural Colleges and Experiment Stations. Motion carried.

A MEMBER: I should like to say in this connection that if we were more closely affiliated with the Association of Agricultural Colleges and Experiment Stations it would be easier to get the expenses paid than when the entomologists hold themselves aloof.

PRESIDENT SANDERSON: I would say that the meeting of the Journal Publishing Company will be held this evening at 7.15 at Hotel Dyckman. The election of officers has already taken place under the report of the Committee on Nominations.

On motion, the President appointed a committee consisting of Messrs. Washburn, Herbert Osborn and Burgess to take up with a similar committee of the Entomological Society of America the matter of securing positions for entomologists.

MR. SYMONS: I move that the time and place of the next meeting be left to the Executive Committee.

PRESIDENT SANDERSON: That finishes the business. The Committee on Nominations has selected the following standing committee on Entomological Investigations: Messrs. Sanderson, Headlee, Titus, Sherman and Britton.

PART II

PRESIDENT SANDERSON: Unfortunately neither of our vice-presidents are present at the meeting, therefore I will ask Professor Summers to take the chair.

CHAIRMAN SUMMERS: We will now listen to the annual address of the president.

AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

In accordance with the constitution the following committee on membership has been appointed for the year 1911: Dr. John B. Smith, Chairman, Dr. E. P. Felt and Prof. Herbert Osborn.

F. L. WASHBURN, *President.*

THE WORK OF THE AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

By E. DWIGHT SANDERSON, *Morgantown, W. Va.*

Your president sincerely appreciates the honor conferred upon him in electing him to preside at this, the twenty-third annual meeting of this great association of economic entomologists. He has also had occasion to realize that with this is imposed the duty required by our constitution of presenting an address. In again perusing the scholarly addresses of the former presidents of this association I soon became aware that I had not been chosen for this task from any consideration of the possibility of my maintaining the high standard set by my illustrious predecessors as far as any exposition of entomological knowledge might be concerned. (And may I remark in passing that no entomologist should consider his entomological education complete until he has read the addresses of the former presidents of this association and glanced over the business and programmes of its meetings, for they contain the richest digest of American economic entomology, and will unfold to him the heritage to which he has attained.) I was forced to the conviction that the only reason for my designation for this part must lie in the fact that I have been an ardent believer in the usefulness of this association and have done the best I could to promote its organization and usefulness. If this supposition be true, I may, perhaps, be pardoned for venturing upon a consideration of the work of this association, its sphere, and its future. In doing so I am reminded that ten years ago, at the first meeting of this association which I was able to attend, Vice-President Gillette gave an address on the "Objects of the Association of Economic Entomologists," in which he ably discussed much of the same ground which I shall again present for your consideration. It would seem that some of these fundamental matters are of perennial interest and must needs be discussed and reconsidered with the passing of every decade.

THE OBJECTS OF THE ASSOCIATION

Article 1, Section 2 of our constitution very clearly defines the objects of this association, as follows:

"Its objects shall be: (1) To discuss new discoveries, to exchange experiences, and to carefully consider the best methods of work in economic entomology; (2) to give opportunity to individual workers of announcing proposed investigations so as to bring out suggestions

and avoid unnecessary duplication of work; (3) to suggest, when possible, certain lines of investigation upon subjects of general interest; (4) to promote the study and advance the science of economic entomology." It behooves us, therefore, to occasionally consider whether this organization is developing along the lines laid down in the constitution by its founders, and more recently ratified by us, and how it may be further strengthened and developed.

The first two or three of these objects seem to have been most prominent in the minds of its founders and have been the directing force in its development. In recent years, however, there has been a marked tendency to make the association more of a working organization and to devote attention to the development of the science of economic entomology and its application to public welfare, under the fourth object above, which may be likened to the "general welfare" clause of our federal constitution. With the rapid increase in membership, this tendency must be inevitable, and I shall endeavor to discuss the work of the association under the above heads and to venture some suggestions for its further development.

THE DISCUSSION OF NEW DISCOVERIES

A. *The discussion of new discoveries.*—In 1889 with 22 charter members it was possible for the association to discuss the discoveries of each member who wished to present them, and this was practically so up to 1900 when we had 109 members; but with the 264 members now enrolled, and with every prospect of a steady growth, it is evident that there must be some selection of what "new discoveries" are most worthy of our joint consideration. That some systematic presentation of the advances made in the previous year would be a most useful feature of our meetings can hardly be gainsaid, for with the wide range of investigation now being carried on by a host of workers, it is beyond the power of most of us to keep even fairly well informed concerning even the more important work being done. In his presidential address before the seventeenth annual meeting, Mr. Quaintance made a suggestion[1] which I have always regretted was not more favorably considered and I beg to again call it to your attention. It was "that a person be annually designated for each of the principal natural divisions of the general subject whose duty it will be to present, at the following meeting, a *résumé* of the principal results achieved in that particular branch during the year. The reports of these several persons would become part of our proceedings and could be referred to at will by workers in other lines." A list of such branches of the subject was given which is now generally recognized as a

[1]Bulletin 52, Bureau of Entomology, p. 17.

useful classification. I am sure that the annual *résumé* of insect injuries published by the Bureau of Entomology in the Yearbook of the Department of Agriculture has been most useful as a matter of reference, and I believe that a *résumé* as suggested by Mr. Quaintance would soon be found a most valuable feature of our work. It may be questioned whether such reports would not unduly tax our annual programme, but might it not be possible to have the reports published in the October number of our JOURNAL, and the consideration of those which seem most important might then be arranged for by a programme committee?

THE EXCHANGE OF EXPERIENCE

B. *To exchange experiences.*—This is one of the most valuable features of our annual gatherings of which we do not always secure the largest benefit. Such an exchange may be secured through symposiums upon topics of general interest, by discussion of papers read, and by personal conferences. The latter will be further discussed under item 2. The discussion of papers is becoming more and more limited by the fulness of our programmes. For several years we have advocated the expediency of having one or two symposiums upon topics of general interest, as has become quite common in other organizations of this nature, and various attempts to this end have been made. The committee on resolutions reported at our last meeting in favor of the secretary attempting to arrange such symposiums for this meeting, which was adopted, and your secretary has endeavored to do so. A program committee might be valuable in shaping our programs and ensuring a continuity of policy thereof, and I would suggest the feasibility of a standing program committee to be composed of the secretary and two members, each to serve three years in rotation.

CONSIDERATIONS OF METHODS OF WORK

C. *To carefully consider the best methods of work in economic entomology.*—There has been a marked tendency in our meetings to devote more attention to methods, from which I feel sure we have all derived great benefit. It must be apparent that in attacking new problems we often expend too much time and money in developing methods which later we often find have been worked out by others, unknown to us. There is great need for a compilation concerning methods and apparatus used in investigation in economic entomology. The late Professor Slingerland was engaged upon the compilation of such data for the use of his graduate students, and it is to be regretted that he was not spared to complete a task for which he was so eminently quali-

fied, and it is to be hoped that some one may complete the labor and give us the results in some accessible published form.

ANNOUNCING PROPOSED INVESTIGATIONS

2. "To give opportunity to individual workers of announcing proposed investigations so as to bring out suggestions and avoid unnecessary duplication of work." This topic opens a broad field for the discussion of various matters which have been of interest to this association since its organization. In general we have had but few such outlines of proposed investigations, though there has been a hopeful tendency to make use of this feature of our meetings in late years. It must be evident, nevertheless, that with our present membership it would be impossible for all to avail themselves of this privilege. It must be equally evident to every thoughtful worker that there has been and is an enormous waste of time and money in our investigations through a lack of reasonable coöperation. I would not urge an avoidance of all duplication, or even an attempt to always secure uniformity of method, though that is desirable as far as possible; but is there any reason why several workers who are attacking the same problem in different fields should not confer together in person or by correspondence concerning the problem in hand, the methods and results, so as to be of mutual help? There is a tendency on the part of some to decline such publicity of their plans for fear that some one else will proceed to make use of them, or that some one will appropriate their results. I suppose that entomologists are as prone to the failings of human nature as any other set of men, and that the honest and generous must always suffer from those whose consciences seem somewhat dull in this regard, but I ask in all sincerity, are we to base our relations to each other on the assumption that all our colleagues, or even any considerable number, will not treat our confidence with all the consideration that we ourselves give and expect? If so, I fear we need a revival of entomological ideals. Fortunately, such is not the case. No man who is doing work worthy of recognition need ever fear that his reputation will suffer from that of his imitator, and I always have a lack of sympathy for the man who is constantly fearing that his generosity will be abused. The slogan of the age is "Get together!" and we must remember that we are employed by the people to serve their best interests, and that we must in honor avail ourselves of whatever means will best advance our work to that end and best utilize the expenditure of public moneys.

There has been a considerable advance along this line, and it is now not infrequent for experiment station investigators who are working on the same problem to meet together and carefully consider the

best means of work, its correlation, and uniformity of method so that the results are comparable. Were we informed as to the work our colleagues are doing we might often have such conferences at these meetings, which would be of the greatest value; but unfortunately we often go ahead with a new project in entire ignorance that it is being attacked by another with whom we might readily confer. Then, too, preliminary results, not ready for publication, if exchanged, will often save a large amount of unnecessary work or hasten the progress of investigation.

With these ends in view your executive committee has recommended the establishment of a standing committee to report on the investigations in progress and those contemplated, such a digest to be published in the December number of the JOURNAL, which we will arrange to have issued earlier in the month so that it may be available before our annual meeting. As an example of what such a report might be, Dr. T. J. Headlee has very kindly prepared such a report for this meeting which will furnish some idea as to whether such an undertaking is desirable.

THE IMPORTANCE OF COÖPERATION

This subject of coöperation has engaged the attention of this association at periodical intervals for many years. At its sixth meeting Messrs. Osborn, Smith and Garman, made a carefully considered report on this subject, which, however, seems never to have borne much fruit. With the present organization of entomological work in this country it is evident that any coöperation must be purely voluntary, but that does not necessarily preclude its effective organization. In general we have three classes of workers, those of the state agricultural experiment stations, those of the Bureau of Entomology, and the state entomologists, and we must consider the interrelations of these classes.

COÖPERATION BETWEEN EXPERIMENT STATION ENTOMOLOGISTS

This association had its inception with the organization of the agricultural experiment stations under the Hatch Act in 1888. At its second meeting President Riley in his address discussed some of these problems in a masterly manner. He said,[2] "Every other subject that might be considered on this occasion must be subordinate to the one great question of coöperation. With the large increase of actual workers in our favorite field, distributed all over the country, the necessity for some coöperation and coördination must be apparent

[2]Insect Life, Vol. III, p. 202.

to every one." So it was, and so it always has been; but how little has been accomplished along this line, not only as between the entomologists of the experiment stations, but between all the lines of agricultural investigation. At the time of Dr. Riley's address (1890) it was objected by one member, whom we all know as one of our best workers, that the time had not yet come for such coöperation owing to the pressing demand of immediate, often local, and occasional problems. It would seem that in some respects it is still as far off. With the passage of the Adams Act in 1906 the work of the experiment stations was placed upon a decidedly better basis. Under that act the projects of investigation must be carefully considered, thoroughly outlined and approved by the Department of Agriculture at Washington. Hence there is no reason why workers on similar projects should not arrange for the most feasible sort of coöperation. We may regret that the Office of Experiment Stations has not seen fit, undoubtedly for good reasons, to make known to the different stations what lines of investigation others are contemplating until after they have been well launched, and we might wish that that office might find a means whereby it could aid the sort of coöperation which is evidently feasible. But if that cannot be done, there seems no good reason why the entomologists, at least, may not arrange for coöperative work in any way that may be found practicable.

In the address referred to (*l. c.* p. 203–205), Dr. Riley also called attention to the relation of the experiment stations to the National Department of Agriculture and discussed the matter in a statesmanlike manner. Dr. Riley evidently feared that, as he said, "the old saw to the effect that 'the dog wags the tail because the tail cannot wag the dog' will find another application," referring to the weak condition of the Division of Entomology at that time in relation to the strength which he foresaw that the experiment stations would assume, and the fact that the Hatch Act provided no well-defined, organic relation between the two. But Dr. Riley would have no need for fear had he lived to see the present magnificent organization of our national Bureau of Entomology with its staff of "six hundred and twenty-three individuals, of whom one hundred and thirty-one are trained entomologists"[3]—more than the entire membership of this association ten years ago.

COÖPERATION WITH THE BUREAU OF ENTOMOLOGY

If it is desirable that there be coöperation between station workers, it is equally evident that there should be coöperation between the

[3] L. O. Howard, Science, XXXII, p. 771, Dec. 2, 1910.

Bureau of Entomology and the station and state entomologists, and that there be a well-defined relation between these agencies and a mutual understanding as to their spheres of work. We are glad to note that there has been much more coöperation between the Bureau of Entomology and the station and state entomologists than between the latter, and there seems to be a decided tendency toward a satisfactory working out of the many difficult problems, often complicated by local conditions, which this subject involves. On the other hand, we cannot but feel that a better understanding of the work of the Bureau as it is in progress, would be of distinct advantage to all parties and would conduce to more effective coöperation. At present the only general statement of the work of the Bureau to which entomologists have access is in the annual Executive Report of the Secretary of Agriculture. Unfortunately this deals with the work of the previous fiscal year, and has but little to say of the work then in progress or contemplated. These matters are mentioned so that if there be any feasible means, we may be kept better informed of each other's work, so that there will be a constant tendency toward more coöperation and a stronger professional unity.

THE RELATION OF NATIONAL AND STATE AGENCIES IN AGRICULTURAL INVESTIGATION

This whole question of the relation of national and state governmental agencies is an exceedingly difficult one, as many of our foremost statesmen are discovering, and is fundamentally the same, whether in entomological work or the control of corporations. It has had the consideration of some of our most thoughtful leaders both in affairs of government and in affairs of science. I would commend to you Dr. Riley's discussion above mentioned. More recently the American Association of Agricultural Colleges and Experiment Stations appointed a Commission on Agricultural Research, composed of two men eminent in agricultural research, two eminent scientists not connected with agricultural research, and one representative of the U. S. Department of Agriculture, which reported at the meeting at Washington, November, 1908. The commission was composed of David Starr Jordan, Carroll Davidson Wright, Henry Prentiss Armsby, Whitman Howard Jordan, and Gifford Pinchot, whose names are a sufficient guarantee of the depth and breadth of the consideration given the subject, but after some discussion it seems to have had no practical outcome. The whole report should be read, but I beg your indulgence for one or two quotations, which seem to digest this whole question in an admirable manner.

"C. As has been pointed out, there is an extensive overlapping of the fields of effort of the United States Department of Agriculture and of the Agricultural Experiment Stations. It is evident that such a situation cannot wisely be allowed to continue. So far as possible the functions and fields of operation of these agencies should be clearly outlined. This is essential to definiteness of aim, freedom of opportunity and the encouragement of the investigator. Moreover, when two or more public agencies are working toward the same general end, their efforts should be in well-considered adjustment, this being a requisite for economy and efficiency of effort."

"The relation that the national department and an experiment station as research agencies should sustain to each other and to the agriculture of the nation and of a given state is one that relates to a wise public policy rather than to scientific prerogatives. The real question is, how can public funds be distributed to render the greatest possible service in the aggregate; not merely in the promotion of material prosperity but especially in developing the ability of localities and individuals to deal intelligently with their own problems? This question touches a principle which underlies our federal system, the observance of which is necessary to preserve the efficiency and method of our democratic institutions. The principle is this: 'Questions which concern primarily and chiefly the people of the locality are to be left to the determination of the locality: questions which concern primarily and chiefly the people of the nation are to be left to the determination of the nation.'"

And further on they conclude: "The interstate or national character of a problem, however, increases rather than diminishes its local importance, while the local application may be after all the main end to be attained by the solution of a national problem. It seems evident, then, that certain classes of problems should be handled by national and state authorities acting jointly. The extent and method of this coöperation must necessarily vary with circumstances. When a national agency takes hold of such questions, it needs to avail itself of the experience and knowledge of local conditions possessed by local agencies, and, therefore, will wisely work through these agencies as far as possible, supplementing them where necessary, but employing its own agents directly only where the local agents are insufficient. At present, effective means of the correlation of national and state agencies is lacking, and the want of it is a serious hindrance to the progress of agricultural research. As a means to that end we recommend the formation of a permanent board made up of representatives from institutions receiving federal or jointly federal and state aid. This board should meet frequently to discuss the mutual relations of

the different institutions and agencies, defining from time to time the principles that should govern each. The influence of such a board if properly organized might be considerable. It may be comparable with that of the Board of State Governors, recently in session in Washington."

To some phases of this report Mr. Gifford Pinchot dissented and presented a separate memorandum, a paragraph of which may be quoted in this connection.

"It is the clear duty of the state agricultural colleges and experiment stations on the one hand, and of the United States Department of Agriculture on the other, to lay aside their differences, if they have any, and to work unitedly for the common good of all the people. There is far more work to be done than all available means can possibly accomplish. Agricultural research does not need to wait on opportunity, for opportunity is already here in overwhelming measure. To meet the huge demand in this field requires united effort. To be effective, united effort must be organized. Instead of the unconvinced and unconvincing suggestion for an advisory board contained in the report, I desire for my own part to substitute the statement that the fundamental need of agricultural research in the United States is a thoroughgoing coöperation between the state and national agencies, under a definite but not a rigid plan. In my judgment such coöperation can be best reached, and the necessary plan can best be prepared and modified, through the agency of a coöperation board or similar body representing both state and nation, created on the assumption that state and national agencies are simply parts of one great instrument which exists for the general good, and organized to give that view effect. Such a board should be required to make suggestions for the coördination and advancement of agriculture and agricultural research in the states and nation but it should be without, wholly and altogether, direct authority beyond what might be inherent in the value of the methods and work it would suggest. It should give no orders."

Although these recommendations differ somewhat in detail the essential objects are the same, and evidence the general appreciation of the need of more coöperation in research work. That such coöperation is not so easily arranged at present as it might have been twenty years ago is at once apparent when it is remembered that some of our agricultural experiment stations are almost wholly dependent upon federal appropriations, while in other states the funds received from the national government comprise but a minor part of the total income of the station. Obviously any plan of coöperation must be voluntary, if it is to succeed in a broad way.

The relations of the state entomologists to the state experiment stations is usually a matter dependent upon local circumstances, but

their relation to the National Bureau of Entomology is much the same as that of the station entomologists.

POSSIBLE COÖPERATION DEMANDS CONSIDERATION

I have discussed this matter of coöperation somewhat at length in order to again bring to your attention the serious consideration that has been given it by some of our most eminent and respected workers in agricultural research. I am not prepared to offer any suggestions as to just how better coöperation may be brought about, except through a greater publicity of the work undertaken and proposed, but I do most earnestly commend the whole problem to the careful consideration of this association. The official agricultural chemists have done most efficient coöperative work in a large way. May not the official entomologists profit by their experience as modified to meet their own needs?

3. "To suggest when possible certain lines of investigation upon subjects of general interest." This has been done at various times by individuals and committees of this association. Were a committee to report on the entomological work of the year, as suggested above, they might very readily make such suggestions from time to time as a result of their survey of the lines of work which seem most promising or are not receiving sufficient attention.

4. "To promote the study and advance the science of entomology." As before suggested, this may be considered the "general welfare" clause of our constitution under which we may proceed to do whatever seems best for advancing the science of economic entomology.

THE TEACHING OF ECONOMIC ENTOMOLOGY

First let me call your attention to the phrase "to promote the study." I fear that we have somewhat neglected this phase of our entomological work, both in our annual programs and in our published papers. For some time I have had a desire to know how entomology, and particularly economic entomology, is being taught in our colleges and universities, and I have had the feeling that most of us had very much to learn along that line. I fear that we have given vastly more attention to our investigations than to our teaching, usually due to circumstances beyond our control, and that many times our students have finished a course with more of a general smattering than a concrete and practical knowledge of insect life and the control of agricultural pests. A symposium upon this subject has been arranged for this meeting, and may we not have more consideration of the subject matter and methods of instruction in economic entomology.

Our constitution specifically provides for the admission of teachers as members, and in the future we will see more of a separation of the function of teaching and investigation, as is now taking place in all lines of agricultural instruction and research.

THE DUTY OF THE ASSOCIATION TO THE PUBLIC

As with all national organizations of a public character, as this association has grown in membership and as it will grow in the future, its responsibilities to the public increase, and if it is to receive the general support necessary for its successful maintenance it must not only maintain an annual meeting for the presentation of papers and the discussion of the problems of the profession, but it must exercise its influence in all legitimate ways toward conserving the best interests of our people as they may be affected by insect life. In recent years this association has had an increasing influence in encouraging needed legislation and in educating the general public upon matters entomological which are of general concern. At the present time one committee is aiding in securing the passage of a national law for the inspection of importations for insect pests. This committee should be given the most loyal support in any way which may lie within our power, for it is almost a reflection on American entomologists that they have for so long allowed so important a matter to be neglected, particularly in view of the many insect plagues which have visited our shores from foreign countries. In such matters a committee of this association should have the same authority and prestige as a representative committee of the Official Agricultural Chemists or of the American Medical Association as related to matters concerning those professions. I fear such is not the case. If not, the fault is not with Congress, nor with the public. The influence of this association is and will be what its members make it, which in the last analysis will depend upon their own estimate of their usefulness and duty to the state. Underlying the success of this organization, as with all professional associations, lies the pride of the man in his profession and his belief in its usefulness to mankind. With a true appreciation upon the part of each member of his opportunity in promoting the public weal, of both his privileges and his duties, we cannot but have an association truly national in scope and influence, and in which we all may well be proud to be enrolled.

OUR PAST ACHIEVEMENTS AND FUTURE OPPORTUNITIES

The problems which present themselves to us for solution seem difficult and sometimes almost impossible, but when we look back over

the past twenty years and consider the marvelous work which the members of this association have accomplished for the American farmer, often under the most unfavorable and discouraging conditions, we may well take heart and resolve to maintain this standard of achievement. But we must remember that

> "New occasions teach new duties;
> Time makes ancient good uncouth;
> They must upward still, and onward,
> Who would keep abreast of truth."—*Lowell.*

And so in the affairs of this association. Now and then we need to take our bearings and make sure that we have not drifted from the true course, and again before venturing on new voyages we should first test our compasses and make sure that they are correct and that we may safely follow them. To such observations it has been my privilege to invite your attention this morning, and if it may lead to a fuller appreciation of the real sphere of this association and the great work which lies before it, I shall feel that I have been well repaid for venturing to present these thoughts for your consideration.

PRESIDENT SANDERSON: We will proceed with the program as arranged by the secretary. I would like to ask before we start on the program what is the pleasure of the association as to the time to be allowed for the reading and discussion of papers. There seems to be no time allowed on the program for discussion.

A MEMBER: I move that the time of presenting papers be limited to fifteen minutes, and not more than five minutes be allowed any member for discussion. Carried.

PRESIDENT SANDERSON: The first number on the program is "Economic Entomological Investigations now Under Way," by T. J. Headlee, Manhattan, Kan.

A BRIEF REPORT ON THE WORK NOW BEING PROSECUTED BY SOME ECONOMIC ENTOMOLOGISTS IN THE STATE UNIVERSITIES, AGRICULTURAL COLLEGES, AND EXPERIMENT STATIONS OF THE UNITED STATES

By T. J. HEADLEE, PH.D., *Professor of Entomology and Zoölogy in the Agricultural College, and Entomologist and Zoölogist of the Experiment Station of Kansas*

INTRODUCTION

The following suggestion was presented to the executive committee of the American Association of Economic Entomologists by Mr. E. D. Sanderson.

"It has seemed to me that entomological workers are wasting time and effort in duplication of each other's work without knowledge of what is being done. A knowledge of each other's plans might often preclude unnecessary duplication. In other cases it would insure investigations being carried on in such a manner that the results would be comparable, instead of being so uncomparable as sometimes to lend themselves to conflicting interpretations. We cannot control or compel this, but publicity is a great thing for all such evils. Might we not have a standing committee to report on the progress of economic entomology during the year and to outline the investigations under way or contemplated by American entomologists? This could be done by sending a questionaire to all our workers during the early fall and asking for replies by November 1. The report of the committee might then be published in the December number of the JOURNAL, and would furnish the basis for conference between workers interested along the same lines while at the winter meeting. It has often occurred that I have been to a meeting and afterwards learned that another man who had been there was working along the same line I was, but I did not know of it at the time. The exchange of views on such matters should be the chief value of our meetings."

The committee deemed this suggestion sufficiently valuable to merit presentation to this association at its twenty-third annual meeting, and to the end that the members might have more data for deciding whether such a feature as that suggested should be made a regular part of our meetings, requested the writer of this account to prepare a sample report. Although the time was very short, it was thought that enough material might be gotten together to admit of the preparation of a brief statement that would serve the purpose. A tabulated list of the projects that have been reported to him will be placed in your hands for the purpose of enabling you readily to

find and confer with any attending member who may be working along lines in which you are interested, and your attention will be invited to some of the striking general tendencies that prevail in the entomological projects as a whole.

Acknowledgments are due to the many gentlemen whose names and addresses appear in the tabulated list of projects.

On or about November 7, the following letter was mailed to all leading entomologists whose names appear in the recent Organization List of the Agricultural Colleges and Experiment Stations in the United States, and to such other members of the Society as were known to be actively engaged elsewhere in economic entomological work. Through some oversight, due to rush of work, the Canadian members were not furnished with a copy, and this is mentioned as a matter of keen regret because of the splendid activity shown by the entomologists across the line. No doubt still others have been overlooked, and it is desired hereby to assure them that the oversight has been unintentional and unavoidable.

MY DEAR SIR:

The accompanying suggestion was presented by Mr. E. D. Sanderson to the executive committee of the American Association of Economic Entomologists. The committee has held that this suggestion is worthy of presentation to the society, and in order that the members may have better basis for judging the desirability of making something of this sort a regular feature of our meetings, has requested me to prepare a sample report on the entomological work now going forward.

Of course, the time before the meeting is too short to permit the preparation of an exhaustive treatment, but if the workers will respond promptly, something can be done to set forth the general lines of effort and to show each man the ones who are working on lines similar to his own, and something of their methods of attack.

I should, therefore, appreciate your prompt answer to the following points, and any others that may occur to you as valuable. It is quite possible that you do not desire to give the information on some of these points. If so, omit.

For each project you are now prosecuting, state:

1. Name.
2. Object.
3. Reasons for undertaking.
4. Scope.
5. Coöperation with other departments or bureaus.
6. General difficulties you are experiencing.
7. General methods you are using.
8. Progress.
9. Source of funds used for its support.

Let me urge upon you that this report will be what you make it. If you respond fully and promptly, you will make possible a pretty good test of the worth of the scheme, but if you respond too slowly or too briefly, the result will not be worthy of your consideration.

Hoping for the favor of an immediate reply, I am

Very truly yours,

In all, 66 letters were sent out, and 40 replies were received. All who answered regarded the suggestion favorably, and 34 expressed willingness to furnish information for a sample report. Twenty-four had economic entomological work in progress and sent statements of it.

The replies showed that 25 stations which were prosecuting projects had a total of 101 under way. The numbers in the individual cases ranged from one to twelve, and the average was four. When we consider that the entomologists reporting are distributed from ocean to ocean, and from the Great Lakes to Gulf, it seems perfectly reasonable to consider their work as representative of that which is going forward in the country at large.

Of the 101 projects 97 are strictly entomological, and of these 92 may be classed as research, three as demonstration and two as law enforcement. No doubt both demonstration and law enforcement are low simply because most of the entomologists who responded understood that the suggestion referred to research work only. When the research projects are carefully examined, approximately 63% of them may be characterized as more or less fundamental studies of the life economy of some individual or group of injurious creatures, carried on in the hope of finding new measures for control or improving the ones already in use; 9.7% is concerned with the systematic relationships and life economy of a group, some members of which are injurious; 19.6% deals with the improvement of already recognized measures of control and the balance is distributed through general study of morphology, parasitism, distribution, and effect of environment.

It is thus strikingly shown that economic entomologists yet find much to do along lines of life history and methods for control study, and that only a very small minority is definitely searching for the general laws which govern insect life in its various relations. Such projects as that of Mr. H. T. Fernald on the value of insect parasitism and that of Mr. Hinds on the factors governing the production and efficiency of certain fumigants, show that this field is being tilled to some extent.

Of the projects of research more than half deal with subjects that have already received more or less attention, and in a number of cases practically the same project is under consideration at several different stations. This may be taken to mean that a considerable amount of duplication of work is occurring. The reasons for taking up subjects, which have already received or are now receiving much attention at the hands of other entomologists, are well shown in the statements accompanying the letters which set forth projects under consideration. Mr. H. A. Gossard has the following to say on this point:

"I should feel myself utterly incompetent to advise my constituents regarding the proper treatment for the codling worm, plum curculio, San José scale, oyster shell scale, scurfy scale, or a hundred other insects if I had not worked them out personally, and tested the recommendations of others, no matter from whence they came or with what authority they were backed." Again, speaking of his work on the wheat joint worm Mr. Gossard says: "We receive hundreds of letters each year in regard to this insect, and are often asked to deliver lectures upon it at Farmers' Institutes. We cannot do this satisfactorily without having a first hand acquaintance with it and are satisfied that, however good may be the work done by agents of the United States Government and entomologists of other states, we will at least be able to contribute something which they have not found." Mr. H. A. Surface has the following to say on this point: "I consider it very important for economic entomologists to work out in their own states the problems that are there present, and if results on these lines have been obtained in other states, I think it highly necessary for each entomologist first to try the methods and make personal observation of the results before he places them before the public."

Briefly, then, subjects, which have already been or are now being investigated, are made projects of research because the entomologist finds that in order to intelligently advise his constituents, it is necessary to know how measures worked out elsewhere will operate under local conditions, or that there are noteworthy differences in habit or that the commonly recommended measures are inadequate.

Whether this duplication is necessary and desirable or merely a waste of effort is also well discussed in the letters. Mr. W. E. Britton says, "There are many cases where local demand seems to warrant the taking up of work in a certain state where there has happened to be more or less duplication, and I do not see how it can be avoided. Many people expect that work of a certain nature will be done by the station, and wish to see it done in their own orchards, sometimes placing trees, labor and materials at the disposal of the station. It is hardly worth while to ignore such demands, and while there is some loss of money and effort on account of this duplication, in many cases it is a good thing in that the work of one man will corroborate that of another, or if results should differ, it simply shows that more work should be carried on along the same line." Mr. E. W. Berger says, "I am inclined to regard it (duplication of work) as a verification of each other's work. If it disagrees, it is evident that somebody has blundered and the work must be done over," Mr. H. A. Gossard says, "I believe that there has been too little duplication of entomo-

logical work in the past rather than too much. We never knew how to handle the codling moth for instance, until we had the results of many workers, and we have not yet reached full conclusions as to the exact methods to be pursued in all sections of the country. I do not think that it would be a waste of energy in the field of economic entomology, but a positive advantage to it, if every entomologist in the United States would devote more or less attention to this problem for the next two or three years and put his results in print. . . . I am satisfied that the public appreciates far more the thorough and practical solution of one big problem to which many workers have given their best efforts than it does the partial or incomplete solution of a hundred problems, more or less important, to each of which a single worker has given some time and then dropped the subject. There are at least ten or twelve great entomological problems which confront the American people, every one of which deserves the same thorough-going attention from every entomologist in the country which has been given to the codling moth work. It is doubtless a good movement to learn of the entomologists who are pursuing the same lines of work, but in my opinion, this should be for the purpose of discussion of methods and for mutual helpfulness and not with the idea that they are likely to solve the question a little too well." Mr. H. A. Surface says, "I believe that more good will finally come from parallel studies by different persons than from leaving all investigation of one topic to one alone. The personal equation is in itself sufficient to justify different workers in the same line."

Evidently, then, there is, in the opinion of many entomologists, a type of duplication that is necessary and highly desirable. It appears that the extreme importance of reliable knowledge of measures for controlling seriously injurious insects, coupled with the fact that both the life economy of the creature and the efficiency of the methods for its control will be found to vary with local conditions, renders the duplication of work incidental to study of the same subject by entomologists whose territories are seriously affected, not only permissible but necessary. At the same time there is no reasonable doubt that some of the duplication incidental to such procedure, and much of that incidental to simultaneous work on insects of little or no economic importance is a waste of time and effort, which, with full knowledge of what is going on elsewhere, could largely be eliminated.

The ultimate object of all this effort is the most complete human control of insect life that is possible, and the worth of a piece of work should be measured by the extent to which it furthers this end. In the light of this principle are we not devoting too much time to immediate life history and control, and too little to general principles and

laws? Are we duplicating one another's work too much or too little? Are there not many places where the knowledge of what is in progress elsewhere may enable us to avoid waste of effort? All these and many other questions could be taken up and dealt with in a broad-gauged manner by such a committee as that suggested.

Indeed, it seems that the multiplicity of projects under consideration, when connected with the facts that the very important pests have already had much study and that more than half of the present research work is concerned with subjects that have already had considerable attention, would render an attempt at standardization imperative. Efforts in this direction should involve not only the gathering of information on projects under consideration and presentation of it to the members of this society, but should include a broad-gauged discussion of the characteristic tendencies of the researches as a whole, pointing out the desirable and undesirable features, and suggesting changes whereby conditions may be improved.

This report should be in the hands of the members before the annual meeting in order that they may have time to prepare discussions of the report for presentation at the regular meeting.

A committee selected by this association, consisting of men who thoroughly represent the entomological interests of each of the various sections of North America, would perhaps prove the most successful means of effecting a useful and practical standardization of our work.

PROJECTS NOW UNDER CONSIDERATION AT STATIONS FROM WHICH INFORMATION WAS RECEIVED

ARTHROPODA
(Not insects)

	Name of Project	*Investigator*	*Address*
1	A Systematic and Biologic Study of the Crayfish of Mississippi. (Coöperation with department of rural engineering).	R. W. Harned.....	Agr. Col., Miss.
2	*Eriophyidae* of New York.....	H. E. Hodgkiss...	Geneva, N. Y.
3	Red Spiders.....	A. L. Melander ...	Pullman, Wash.

ARTHROPODA
(Insects)

Orthoptera

4	Tree Crickets.....	P. J. Parrott.....	Geneva, N. Y.

Hemiptera

5	Efficiency of *Sporotrichum globuliferum* in dealing with the Chinch Bug.....	P. A. Glenn and F. H. Billings....	Lawrence, Kan.

Hemiptera (Continued)

	Name of Project	*Investigator*	*Address*
6	Chinch Bug Investigations. (A fundamental study of the life economy and of measures of control.)	T. J. Headlee and J. B. Parker	Manhattan, Kan.
7	Chinch Bug Disease (*Sporotrichum globuliferum*). (A study of its distribution and effectiveness in Oklahoma.)	C. E. Sanborn	Stillwater, Okla.
8	False Tarnished Bug. (A complete study of life history, habits, and methods of control.)	H. E. Hodgkiss	Geneva, N. Y.
9	Study of Leaf Hoppers Affecting Cereal and Forage Crops. (A study of their systematic relationships, life economy and geographical distribution of the insects within the United States.)	Herbert Osborn	Columbus, Ohio.
10	Apple and Pear Membracids	H. E. Hodgkiss	Geneva, N. Y.
11	Pear Psylla. (A complete study of its life history, habits and methods of control.)	H. E. Hodgkiss	Geneva, N. Y.
12	*Macrosiphum solanifolii* and Related Species. (A study of morphological, systematic and host plant phases.)	Edith M. Patch	Orono, Me.
13	Researches on the Biology of the Green Bug (*Toroptera graminum*)	S. J. Hunter and graduate student assistants	Lawrence, Kan.
14	Green Bug Investigations. (A fundamental study of its life economy and of measures of control.)	T. J. Headlee and J. B. Parker	Manhattan, Kan.
15	Infestation of Cowpea Aphis (*Aphis medicaginis*). (A study of the life history and methods of control.)	C. E. Sanborn	Stillwater, Okla.
16	Melon Louse (*Aphis gossypii*). (A study of life history and of methods of control	C. E. Sanborn	Stillwater, Okla.
17	*Pemphigus tessellata* Fitch. (A study of life economy.)	Edith M. Patch	Orono, Me.
18	The Woolly Aphis (*Schizoneura lanigera*) (A study of life history, systematic relationships and methods of control.)	Paul Hayhurst	Fayetteville, Ark.
19	The Woolly Aphis, its Prevention and Control	H. W. Lorenz	Lawrence, Kan.
20	The Woolly Aphis. (A study of the use of pear roots as a means of eliminating its work.)	Fabian Garcia	Agr. Col., N. Mex.
21	Control of Woolly Aphis. (A study of the effect of liquid spray and tobacco dust when applied to infested orchard planting or nursery stock.)	T. B. Symons	College Park, Md.
22	Plant Louse Investigations. (A monographic study of the Colorado species)	C. P. Gillette	Ft. Collins, Col.
23	Plant Louse Remedies	C. P. Gillette	Ft. Collins, Col.
24	Ecological and Morphological Notes on Aphididæ of Maine	Edith M. Patch	Orono, Me.

Hemiptera (Continued)

	Name of Project	*Investigator*	*Address*
25	The Citrus White Fly. (A study of its biology and measures for its control.)	E. W. Berger	Gainesville, Fla.
26	San José Scale Survey and Suppression	C. B. Twigg, M. L. Breidenthal and A. J. Spangler	Lawrence, Kan.
27	San José Scale Suppression. (Locating and destroying it.)	T. J. Headlee and L. M. Peairs	Manhattan, Kan.
28	San José Scale Suppression. (Experimental and demonstration treatments in different parts of Pennsylvania.)	H. A. Surface	Harrisburg, Pa.
29	San José Scale Disease. (A study of the efficiency of *Sphærostilbe coccophila* in the control of San José scale in Oklahoma.)	C. E. Sanborn	Stillwater, Okla.
30	Peach Lecanium. (A study of the effectiveness of different oil sprays applied in fall and in spring.)	T. B. Symons and E. N. Cory	College Park, Md.
31	Investigation of the Peach Lecanium. (A study of methods of control.)	H. A. Surface	Harrisburg, Pa.
32	A Systematic and Biologic Study of the Scale Insects of Mississippi	Begun by Glenn W. Herrick and continued by R. W. Harned	Agr. Col., Miss.
33	Fungous Diseases of Scale Insects	Benjamin W. Douglass	Indianapolis, Ind.
34	Distribution of the Scale Insects of Indiana	Benjamin W. Douglass	Indianapolis, Ind.

Lepidoptera

35	The Pine-tip Moth as Affecting Young Trees on one of the Government Plantations in Central Nebraska	Lawrence Bruner	Lincoln, Neb.
36	Grape-berry Worm	H. A. Gossard	Wooster, Ohio.
37	Codling Moth. (A study of seasonal history and spraying.)	C. P. Gillette	Ft. Collins, Col.
38	Codling Moth. (A study of life economy and of measures of control.)	T. J. Headlee and A. Dickens	Manhattan, Kan.
39	The Codling Moth. (An extensive study of life economy for the purpose of learning how to spray more efficiently.)	Fabian Garcia	Agr. Col., N. Mex.
40	The Codling Moth. (A study of spray efficiency.)	E. P. Felt	Albany, N. Y.
41	Spraying for Codling Worm. (A study of the types of treatments which will year after year give the best average control.)	H. A. Gossard	Wooster, Ohio.
42	The Codling Moth	A. L. Melander	Pullman, Wash.
43	Sod Web-worms	H. A. Gossard	Wooster, Ohio.
44	The Bud Moth and Other Apple Insects	A. L. Melander	Pullman, Wash.

Lepidoptera (Continued)

	Name of Project	*Investigator*	*Address*
45	A Seasonal Study of the Lesser Apple Worm	Benjamin W. Douglass	Indianapolis, Ind.
46	The Peach-tree Borer (*Sanninoidea exitiosa*). (A study of methods of shutting the larvæ out of the tree in relation to the period of moth emergence.)	Paul Hayhurst	Fayetteville, Ark.
47	Investigation of the Peach-tree Borer. (A study of life history and of methods of control.)	T. B. Symons and E. N. Cory	College Park, Md.
48	A Study of the Peach-tree Borer	R. W. Harned	Agr. Col., Miss.
49	Corn Ear-worm Investigations. (A study of life economy and of measures of control.)	T. J. Headlee	Manhattan, Kans.
50	Preventing the Spread of Gypsy and Brown-tail Moths	D. M. Rogers	6 Beacon St., Boston, Mass.
51	Alfalfa Web-worm. (A study of life history and methods of control.)	C. E. Sanborn	Stillwater, Okla.
52	Apple and Cherry Ermine Moths	P. J. Parrott	Geneva, N. Y.

Diptera

53	The Fungous Gnats of North America. (A systematic review of the family, life history studies, and economic bearing.)	O. A. Johannsen	Orono, Me.
54	Hessian Fly. (A complete study of life history, habits and methods of control. Coöperation with U. S. Bu. of Ent.)	P. J. Parrott	Geneva, N. Y.
55	Hessian Fly	H. A. Gossard	Wooster, Ohio.
56	Gall Midges. (A systematic and biologic investigation.)	E. P. Felt	Albany, N. Y.
57	Grape Midge	F. Z. Hartzell	Geneva, N. Y.
58	Cabbage Maggot. (A complete study of life history, habits, and methods of control.)	W. J. Schoene	Geneva, N. Y.
59	Investigation of the Apple Maggot, *Rhagoletis pomonella*. (An exhaustive study of life economy and of measures of control.)	W. C. O'Kane	Durham, N. H.
60	Structure of Root Maggots	W. J. Schoene	Geneva, N. Y.

Coleoptera

61	A Study of the Sugar Cane Beetle	R. W. Harned	Agr. Col., Miss.
62	Study of the Bean Leaf Beetle	R. W. Harned	Agr. Col., Miss.
63	White Grubs	H. A. Gossard	Wooster, Ohio.
64	A Study of the Spread of the Boll Weevil in Mississippi, with Special Reference to its Habits Under Different Environments, and of its General Biology. (Coöperation with U. S. Bu. of Ent.)	R. W. Harned	Agr. Col., Miss.

Coleoptera (Continued)

	Name of Project	*Investigator*	*Address*
65	Investigation of the Life History, Economic Relationships, and Injury of the Rice Weevil (*Calandra oryzae*) Attacking Corn in Alabama, with a Study of Methods of Control	W. E. Hinds	Auburn, Ala.
66	Plum Curculio Investigations. (A study of life economy and measures of control.)	T. J. Headlee and A. Dickens	Manhattan, Kans.
67	Plum Curculio	H. A. Gossard	Wooster, Ohio.
68	*Polydrosus impressifrons*, a Newly Imported Snout Beetle	W. J. Schoene	Geneva, N. Y.
69	Physiological Effect of Lead Arsenate on Weevils of the Order *Rhynchophora*. (Coöperation with Chemical Dept. of Station.)	Wilmon Newell	College Sta., Tex.
70	The Practical Use of Powdered Lead Arsenate in Controlling the Cotton Boll Weevil	Wilmon Newell	College Sta., Tex.

Hymenoptera

71	An Apple Mining Saw-fly	A. L. Melander	Pullman, Wash.
72	The Life History of a Species of Saw-fly (*Lophyrus*) that has Attacked *Pinus ponderosa* in the Northwestern Part of Nebraska	Lawrence Bruner	Lincoln, Neb.
73	A Study of the Aphidinæ. (A study of the taxonomy of the members of this group and of the life economy of the more available and important species.)	A. B. Gahan	College Park, Md.
74	The Clover Seed Chalcis (*Brucophagus funebris*)	F. L. Washburn	St. Anthony Pk., Minn.
75	Investigation of the Apple Seed Chalcis. (A study of life history, enemies and methods of control.)	H. A. Surface	Harrisburg, Pa.
76	Wheat Joint Worm as it Affects Wheat in Ohio. (A complete study of life economy and measures of control.)	H. A. Gossard	Wooster, Ohio.
77	Wheat-straw Worm	A. L. Melander	Pullman, Wash.
78	Practical Control of the Argentine Ant in Orange Groves	Wilmon Newell	College Sta., Tex.
79	Foul Brood of Bees	A. L. Melander	Pullman, Wash.

General Subjects

80	Insects Injurious to Stored Grains and Stored Grain Products. (A study of life economy and measures of control.)	George A. Dean	Manhattan, Kan.
81	A Systematic and Biologic Study of Insects Injurious to Pecans	Begun by Glenn W. Herrick and continued by R. W. Harned	Agr. Col., Miss.

General Subjects (Continued)

	Name of Project	*Investigator*	*Address*
82	Insects of Forest and Shade Trees	H. A. Gossard,	Wooster, Ohio.
83	Grape Insects, Especially Root Worm, Rose Chafer, and Leaf Hopper. (A complete study of life history, habits and methods of control.)	F. Z. Hartzell	Geneva, N. Y.
84	Insects that Affect Health	A. L. Melander	Pullman, Wash.
85	Biological Survey of Insect Life of Kansas	S. J. Hunter and F. X. Williams	Lawrence, Kan.
86	A Study of the Actual Value of Insect Parasitism	H. T. Fernald	Amherst, Mass.
87	A Physiological Study of the Internal Changes Induced by Endo-parasites	A. L. Melander	Pullman, Wash.
88	Environmental Study of Hessian Fly and the Plant Lice Injurious to Wheat. (A study of the effect of various elements of the environment on the life economy of these creatures.)	T. J. Headlee	Manhattan, Kan.
89	Some Spraying Experiments on Apples and Peaches in Foliage with Various Lime and Sulphur Mixtures to find out Their Effects as Summer Sprays Upon the Various Insects and Fungi Prevalent in Connecticut. (Coöperation with the botanist.)	W. E. Britton	New Haven, Conn.

Incidental to Insect Control

90	Investigation of the Factors Governing the Production, Diffusion, and Insecticidal Efficiency of Hydrocyanic Acid Gas and Carbon Disulphide Vapor as used in Economic Entomology	W. E. Hinds	Auburn, Ala.
91	Spraying Materials and Combinations	H. A. Gossard	Wooster, Ohio.
92	Different Makes of Spraying Machinery	H. A. Gossard	Wooster, Ohio.
93	Dipping Nursery Stock. (A study of the effect of different insecticidal dips used on both roots and top in fall and spring.)	T. B. Symons	College Park, Md.
94	The Relation of Insecticides to the Burning of Foliage	H. T. Fernald	Amherst, Mass.
95	The Limits of Toxicity of Lime-sulphur	A. L. Melander	Pullman, Wash.
96	Toxicity of the Salts of Arsenic and Lead	A. L. Melander	Pullman, Wash.
97	Investigation of the Substances used for Insecticidal, Vermicidal, and Fungicidal Purposes,—Their Action, Relative Value, and Practical Application	Fred. B. Lowe	Detroit, Mich.

Higher Animals

98	The Food Habits of Birds to Determine the Economic Value of Washington Birds	A. L. Melander	Pullman, Wash.

Unclassified

	Name of Project	*Investigator*	*Address*
99	Demonstration Work. (An effort to convince the farmer that the results of experimental tests are practical and valuable.)	H. A. Surface	Harrisburg, Pa.
100	General Project. (This project is so planned that any species of insect unexpectedly demanding attention can be taken up and properly handled.)	C. P. Gillette	Ft. Collins, Col.
101	The Zoögeography of Washington to Ascertain the Life Zones, to Tabulate the Yearly Spread of Injurious Species, and to Note the Yearly Abundance of Pests	A. L. Melander	Pullman, Wash.

PRESIDENT SANDERSON: We have but a few minutes in which to discuss this paper. What is your pleasure?

MR. LOWE: I notice from the paper Mr. Headlee has presented that is does not include my work. I also notice that he classes in general all entomologists as bureau or station, but there is at the present time another class of entomologists. I do not know how you will quite classify them—they are those who are engaged in work for commercial organizations, fruit growers' associations, sugar planters' associations, those interested in the manufacture of insecticides, etc. It seems to me they are a distinct class, and as some are engaged in deep research work, it seems to me they should be included. I should take pleasure in handing Mr. Headlee an account of my work. Regarding the duplication of work, that is a very interesting thing to me, because, as it happens, I have discovered at this meeting that a member of this association is going over the same ground that I worked out a year ago and nearly completed, and I was not in the least aware that he was working on the same problems about a hundred miles away from me.

MR. HEADLEE: Mr. Chairman, an explanation is probably due. As my time was very short, and it was necessary to get the material together immediately, I turned the matter over to my stenographer with general directions, and the oversights were due to the fact that I did not watch close enough, and that I failed to give minute directions, and, of course, all due apology is due these people, and is hereby tendered.

MR. SUMMERS: On behalf of the membership committee I should like to ask that if the names of any new members are to be handed in, that they be on the regulation blanks, to be had at the secretary's desk, and be handed in not later than this afternoon to Prof. J. B. Smith, the secretary or myself. In regard to another matter, that of associ-

ate membership and active membership, if any of you has a friend whom he thinks should be raised to active membership, who is now on the associate list, please do not mention that fact incidentally to members of the committee, but supply the committee with information in writing, giving a list of his publications. Certainly, if you cannot, in the case of a man you know well enough to wish raised, give information concerning him, you cannot expect us to furnish that information here in the brief time allowed.

By vote of the association the session adjourned.

Afternoon session, Wednesday, Dec. 28, 1910.

The meeting was called to order at 1.30 p. m. by President Sanderson in joint session with the Entomological Society of America.[1]

PRESIDENT SANDERSON: The next paper is on "The Effect of Certain Gases and Insecticides upon the Activity and Respiration of Insects," by G. D. Shafer, East Lansing, Mich.

THE EFFECT OF CERTAIN GASES AND INSECTICIDES UPON THE ACTIVITY AND RESPIRATION OF INSECTS[2]

(*Abstract*)

By G. D. SHAFER, *East Lansing, Mich.*

This paper, as well as the one following on lime-sulphur is a brief of results of some work done on the general subject of how Contact Insecticides kill insects. Early in the study of this subject, it was found that scarcely any insecticide depends upon only one property for its effectiveness. Yet, as a rule, some one property is chiefly concerned. For example, strongly alkaline washes enter the spiracles or penetrate the chitinous covering into the body of the insect and dissolve the fat and proteid portions of the tissue cells. Substances commonly used as fixing agents in histological studies such as corrosive

[1]The following papers were presented and will be published, together with the discussions thereon, in the Annals of the Entomological Society of America; "Some Notes on the Pear Slug, *Eriocampoides limacina* Retz." by R. L. Webster, Ames, Iowa, and "The Locomotion of the Larva of *Calosoma sycophanta*," by A. F. Burgess, Melrose Highlands, Mass.

[2]A more complete account of work mentioned in this paper, as well as the paper on Lime-Sulphur Wash, together with figures of apparatus, tabulated data, etc., will be published shortly in a technical bulletin of the Department of Entomology, Experiment Station, Michigan Agricultural College.

sublimate, penetrate the chitin and precipitate proteid bodies of the tissue cells.

Furthermore, kerosene, and some of the insecticides commonly known as the miscible oils appear to depend chiefly on some other property still. It has been generally believed that these latter substances enter the spiracles and suffocate the insects by shutting out fresh air from the tracheæ. By the use of the stain, Sudan III, in kerosene, gasoline, and such fluids, and by the use of Indigo Carmine in emulsions of the miscible oils, it was shown that contact insecticides of this type do enter the spiracles and tracheæ of plant lice. The same was true also of caterpillars and insects having a protective closing apparatus for the tracheæ, if the fluids were applied thoroughly enough. But, while the presence of these bodies in the tracheæ might interfere with the passage of air, it appeared that the insecticides must kill in some other way than by merely plugging the tracheæ and depriving the insect of oxygen. Insects, which are killed rapidly by kerosene or gasoline, may revive after many hours' confinement in hydrogen, carbon dioxide, or nitrogen. Some species are able to recover after being deprived of oxygen for a much longer period than others. Moreover *Passalus cornutus*, which is quickly killed by gasoline, is able to recover entirely after being submerged for two minutes in pure oleic acid—until all the tracheæ leading from the spiracles are filled. The oleic acid is an oily substance which would be as capable of plugging the tracheæ as gasoline or kerosene.

At 72° to 84° F. it was found that the vapor of the following substances would affect insects: Gasoline, benzine, kerosene, to-bak-ine, pyro-cresol, pine oil disinfectant, creolin, crel oil, chloro-naphtholium, zenoleum, aniline oil, and creosote.

The vapors of the more volatile of these liquids at saturation will kill many insects as rapidly as when an abundant supply of the liquid itself is applied. Death, in the case of the vapor, could scarcely be due to a plugging of the spiracles. Small amounts of the vapor or of the liquid of any of these substances act upon insects much as the common anæsthetics, ether and chloroform. *Passalus cornutus* is a good insect to use in studying the action of these bodies. One can note upon the first application of a small amount of one of these substances, excitement and a more rapid heart beat. Under the influence of larger amounts the actions become uncertain and the heart beat irregular; then the insect will become quiet, and the heart-beats slower and slower until they cease entirely and death results. Hydrocyanic acid, hydrogen suphide, and the volatile portions of pyrethrum act in very much the same way.

It was found that small amounts of kerosene, gasoline, pyrethrum,

etc., increase the rate of excretion of carbon dioxide in insects. Large amounts of the same substances, as they brought about quiet and death, reduced the output of carbon dioxide. When the output of carbon dioxide was increased, the amount of oxygen used increased; as the output of carbon dioxide decreased, the oxygen used decreased in about the same ratio, until when the insect was deeply under the influence of the insecticide (this was tried out especially with gasoline vapor, hydrocyanic acid gas and nicotine) and nearly dead; then the respiratory ratio increased. That is, the amount of carbon dioxide given off was greater in proportion to the oxygen used than was normal.

As evidence that this increase in the respiratory ratio is due to the insecticide, it was shown that death from starvation or from mechanical injury causes a decrease in the respiratory ratio.

Insects confined in pure hydrogen, nitrogen or carbon dioxide, give off carbon dioxide; and the rate of its excretion under this condition, it was found, is often increased by gasoline or by hydrocyanic acid gas—never decreased appreciably, although insects placed in nitrogen for 8 to 10 hours after treatment with one of these insecticides, seemed to recover as well as if they had been left in air. Indeed, the chances of recovery of the former often seemed to be better.

By actual measurement of the gases, it was proven that certain gases and vapors are absorbed into the bodies of insects and that in an atmosphere of pure air, they may be given off again. In case of some gases, their presence in the insect body can be shown by injecting solutions which, upon contact with the gas, give rise to colored precipitates. For example, hydrogen sulphide can be detected in this way by a solution of lead acetate or of cadmium chloride—a black sulphide precipitating in the former and a yellow sulphide in the latter case. The evidence from microscopic sections of insects treated in this way seems to indicate that some tissues of the insect take up the gases or vapors in greater amounts than others. Moreover, the activities of the insects under the influence of the vapors and gases named,—as has already been mentioned,—indicate that the nervous system is especially affected.

Experiments upon the luminous organs of the larva of *Photuris pennsylvanica* indicate that the light-giving power of these organs is due to an oxidation process, since the light of intact or of excised organs ceases in the absence of oxygen (*i. e.*, in carbon dioxide or in nitrogen) and may begin again when air is admitted. Now it would appear that the presence of carbon disulphide vapor interferes with oxidation in these organs since the luminosity decreases and may even be made to cease when the organs are exposed to a sufficient amount of the vapor. The luminosity may then be made to reappear if the

organs are kept moist and brought immediately into pure air or oxygen again.

It is believed that these experiments upon the action of contact insecticides justify the following statements:

Contact insecticides as a rule effect the death of the insect through more than one cause.

Alkaline insecticides, such as the strong soap washes pass rather slowly through the chitinous walls of insects and dissolve the proteids and fats of the tissue cells.

Corrosive sublimate and similar substances, which in solution precipitate proteids, pass slowly through the chitinous walls of insects and precipitate the proteids of the tissue cells.

Most gases penetrate the chitinous walls of insects into the body, rapidly—much more rapidly than liquids.

Gases and liquids may enter the tracheæ through the spiracles and there penetrate the walls of the tracheæ into the body tissues of the insect more rapidly than through the outer chitin. Apparently the more feeble the surface tension of the liquid, the more readily is it able to enter the spiracles of the insect.

In the case of gasoline, kerosene, carbon disulphide and many such insecticides which are volatile, the volatile portions penetrate the body through the tracheæ and through the outer chitin, thus affecting the insect long before the liquid alone would have time to do so. Such insecticides may plug the tracheæ to some extent, but they appear to be effective principally through their ability to interfere, in some way, with the processes of oxidation in the tissue cells.

SOME PROPERTIES THAT MAKE LIME-SULPHUR WASH EFFECTIVE IN KILLING SCALE-INSECTS.

(Abstract)

By G. D. Shafer, *East Lansing, Mich.*

In making a study of how the lime-sulphur wash kills scale-insects, it was found that after treatment with the spray, for several hours before death results, many of the insects lie under their scale coverings in a more or less comatose condition. During this time, if the scale is removed, the insect speedily recovers the ability to respond when touched with a needle. Of course after a few hours in dry air the delicate bodied insect would shrivel and die, but fresh air seemed to be the thing that revived it when the covering was first removed.

Haywood ('07) showed that lime-sulphur sprays contain polysul-

phides of calcium which become oxidized on exposure to air; the products of this oxidation being, at first, calcium thiosulphate and free sulphur. The thiosulphate, itself, he found to be finally oxidized to calcium sulphate. In order to determine whether this process of oxidation might deprive a scale-insect of oxygen when treated with a lime-sulphur wash, measured amounts of the spray were placed either on absorbent paper or glass-wool in containers above mercury with measured amounts of air. Then after various periods of time, the amount of oxygen in the confined air was determined. In this way, it was found that large amounts of oxygen are required to oxidize the calcium polysulphides present. For example, a piece of absorbent paper (10 x 12 cm.) saturated with lime-sulphur (Baume 20.1°) used 87.5 cc. of oxygen in sixteen and one-half hours. If the paper on which the solution was placed remained moist, the polysulphides would all be oxidized in a few hours. If the paper were quickly dried, the remaining sulphides oxidized much more slowly, requiring several days. The thiosulphate of calcium oxidized more rapidly when kept moist than when dry, but in any case, it used oxygen more slowly than the sulphides.

It was found, moreover, that the bark of a dormant apple tree at 11°to 12° C. was using small amounts of oxygen and giving off carbon dioxide. The space beneath a scale covering on such a tree, freshly sprayed with lime-sulphur, must therefore be losing its oxygen from three causes—namely, the oxidation of the lime-sulphur, the respiration of the bark of the tree and of the insect itself. Very few specimens of San José scale could recover after being kept 14 hours in an atmosphere of pure nitrogen.

It was found, also, that lime-sulphur is able to soften the wax around the outer edge of the scale covering of very many of the scales. The older, firmer wax did not dissolve. If the spray passed under the scale covering, its presence could be detected there by the use of corrosive sublimate which gives a black precipitate with the polysulphides of calcium. If only the thiosulphate remained its presence could be detected by silver nitrate with which a black precipitate results.

When the wax, softened by lime-sulphur around the edges of the scale, dries, it often sticks the scale covering so firmly to the surface of the plant as to seal the insect. Sometimes the pygidium was found sticking fast to the dry scale covering. In the case of *Aspidiotus ficus* on orange, seven days after spraying, as many as 22 dead young, 9 living young, and 4 eggs were found sealed in beneath the shield with the mother. Such confinement of course must result in the death of all the family in a few days. After three to four weeks it was found that in many cases, the oxidized salts in the wax of the scale stooled

up forming a white crust which lifted the scale covering so that it might easily be washed or brushed from the tree, thus exposing any helpless insect, not already dead, to weather conditions.

Sulphur dioxide could not be detected coming from a surface treated with lime-sulphur wash, unless when nearly dry, the surface was exposed to temperatures high enough to rapidly vaporize the free sulphur present. It would seem therefore that under natural conditions sulphur dioxide is not formed in sufficient quantity to be of any insecticidal value.

If carbon dioxide is dissolved in lime-sulphur wash, hydrogen sulphide will be formed. This gas is poisonous to insects; but no means was found of proving its presence in effective amounts beneath scales treated with lime-sulphur.

It was not found with certainty, in any case, that lime-sulphur wash penetrated into the body of the insect, although it would kill the cells of a small part of an insect's body touched by it, while other parts of the body remained alive for a time.

The experiments therefore, seem to show that with lime-sulphur wash, it is mainly the combination of the three properties or conditions already described which makes the insecticide so efficient against scale-insects—especially against San José scale which winters in a partially grown condition.

MR. HEADLEE: I have enjoyed this paper very much, and wish to thank Mr. Shafer for it. It is a type of work we ought to have more of. A few thoughts occurred to me while this paper was in process of being given, and one of them is this: Why does the author think that gasoline dissolved out parts of the fat body? Is it not possible that something else entered in and produced the same morphological result?

MR. SHAFER: Mr. President, I think the gasoline affected the "fat body," because in every case where it, alone, was tested for the right length of time, gasoline dissolved the fat body. If kerosene were used it would leave the fat body intact after two hours' treatment. This did not affect the fat body very rapidly, but after a certain number of hours, say eight or ten, I found that the "fat body" began to be dissolved, and in the case of gasoline, if the insect be left in for say twenty-four to thirty hours it will dissolve practically all the fat of the "fat body." The fat will be in solution in the gasoline, so that we can say that is the agent bringing about this result.

Gasoline and kerosene, however, kill the insect before any noticeable solution of the fat body takes place. It is the alkaline wash that can dissolve the "fat body" in one portion of the body of an insect while the other portions of the body are still alive and able to move for a time.

MR. LOWE: I wish also to compliment Mr. Shafer upon his work; it is very, very excellent, and right along my line. I am sorry I have not got our chemist here to dip into the chemical questions he raised. But my findings, I am sorry to say, are not entirely in accordance with his, particularly in some of the fumigants mentioned, which I found did not kill, and some substances I found killed certain insects, and had no effect upon others. There is one other point, and that is clogging spiracles. I have made many experiments along that line, with a great many substances, and have not been able yet to clog the spiracles of an insect. I have used the Cecropia caterpillar, painting the spiracles with kerosene, but have not been able to kill the insect. There is another thing, some of the insecticides, such as ordinary pyrethrum, will kill insects, but other substances equally fine, such as flour and many other substances, have no effect upon the insect when they are entirely immersed in them. I have many criticisms of the paper, but they are more in the light of friendly discussion than criticism.

PRESIDENT SANDERSON: This paper is undoubtedly one we want to digest somewhat before we can discuss it intelligently. We have certainly felt the need of some work of this kind, those of us who have attempted to teach the whys and wherefores of insecticides.

We will now take up the symposium on "Present Methods of Teaching Entomology." The paper prepared by Professor Comstock will be read by Mr. Ruggles.

THE PRESENT METHODS OF TEACHING ENTOMOLOGY

By J. H. COMSTOCK, *Ithaca, N. Y.*

The present methods of teaching entomology followed in the United States have been developed almost entirely by men now teaching this subject. A second generation of teachers has begun its work; but the first is still on the stage. We have progressed far enough, however, to make it worth while for the teachers to compare methods, in order that each may profit by the experience of the others.

In a conference of this kind the contribution of each to the discussion will be, naturally, at first, merely a statement of the methods evolved in our several widely separated institutions. Then can follow comparisons and discussions of the various methods, which may result in the modification of each. I regret exceedingly that I cannot be present to hear the papers of my colleagues, and to take part in the discussion. But unfortunately for me, I can only send my report of progress.

The first professor of entomology in an American university was Dr. H. A. Hagen, who held this position in the Museum of Comparative Zoölogy of Harvard University. But, although the influence of Doctor Hagen upon the few pupils who had the good fortune to study with him was very great, his teaching of entomology was subordinate to his researches in systematic entomology and his work as curator of the great collections of insects of that museum.

Although Doctor Hagen came to the Museum of Comparative Zoölogy in 1870, his first course of lectures was given in the summer of 1873, and his class consisted of a single student, the writer of this paper. That was a course of lectures never to be forgotten by the one who heard it. It was a very hot summer, and Doctor Hagen suffered with the heat. About nine o'clock each morning he would come into the laboratory, say a cheery good morning, take off his coat and hang it back of the door, take off his vest and put it with his coat, take a seat by a small table, light a German pipe with a very long flexible stem, place the bowl of the pipe on the floor behind him, take a few puffs, and then say, "Come and I will you tell some dings what I know." The student would then take a seat on the opposite side of the table, and the professor, with sheets of paper before him, which served the purpose of a blackboard, would take up the subject where it had been dropped the previous morning.

I take the space to narrate this personal experience because this course of lectures had a profound influence in shaping the development of my teaching of entomology. It was just at the beginning of my experience as a teacher of this subject. Although still an undergraduate, I had given one course of lectures in the institution with which I am connected, and the broadening influence of this master came at a very opportune time. Thus early I gained a hint of the scope of entomology, and was led to realize that the practical applications of this science should be based upon a broad and accurate foundation of scientific knowledge.

One, however, must not forget that nearly all of the chairs of Entomology in this country owe their existence to the economic bearing of this subject; it is almost only in agricultural colleges that we find professorships of entomology; and they have been established in these colleges because of the great importance to agriculture of insect pests.

While, therefore, the teacher of entomology should teach the science of entomology, he should not fail to make practical applications of this science so far as possible.

Let us turn now to the more specific problems that the teacher of entomology must meet. In discussing these I will state the conditions that exist in the institution with which I am connected, and will

briefly outline the methods with which the entomological staff of this institution is trying to meet these conditions. In other institutions other conditions doubtless exist, which can be better met by other methods.

The students of entomology in Cornell University can be grouped into four classes; and the special needs of each of these classes must be considered separately in order to reach the best results in our teaching. We have what are termed "Special Students," students who take a short course of study in general agriculture extending over only one or two years; regular students in a four-year course who take entomology only as part of a course in arts and sciences or in general agriculture; regular students in a four-year course who are fitting themselves for entomological work; and graduate students.

First, special students. The special or short-course students can devote so little time to any of the several subjects that they study during the one or two years of their stay in college, that we are able to give them only two periods of entomology per week for a half year. In this brief course given to a class consisting largely of students who have no background of biological knowledge, we can only hope to give some information that will be of immediate practical use to them in their growing of crops or their care of stock, when they return to their farms a few months later.

The course consists of very elementary discussions of the structure and metamorphoses of insects, of accounts of the more important insect pests, with suggestions as to the best methods of combating them, of accounts of beneficial insects, and of field excursions to observe, so far as practicable, the insects discussed. The course is illustrated by many sets of specimens, put up in the Riker mounts, by diagrams, and by a liberal use of the stereoptican and the projection microscope.

Owing to the fact that this course is given during the months of October, November, December, and January, the field-work part of it is of necessity limited. We expect that in the near future there will be a summer session of our College of Agriculture, when an elementary course can be given in which a more desirable balance between lectures and field-work can be obtained.

This course for the special students differs so fundamentally from what we consider desirable as constituting the entomological part of a course leading to an academic degree, that regular four-year students are not permitted to elect it. We look upon it as merely extension work given at the college.

Second, regular students not specializing in entomology. The class of students whose needs are to be considered next are those regular

students in the four-year course of the College of Agriculture who elect entomology as a part of a course in general agriculture and those students in the College of Arts and Sciences who wish to take some entomology but do not care to specialize in this subject.

For these students we give a course consisting of two lectures per week throughout the year and one laboratory period of two and one-half hours each week during the first half-year.

In this course the object is to give information by lectures and training in observation by laboratory work. The students in this class have some foundation of biological knowledge, as a year's work in general biology or a year's work in zoölogy is a prerequisite for admission to the course.

During the first half-year the lectures are on the characteristics of the orders, suborders, and the more important families of insects, and on the habits of representative species; the laboratory work includes a study of the structure of insects and practice in their classification. During the second half-year the subject is treated from the economic standpoint. In the lectures the more important insect pests and methods of controlling them are discussed; and at opportune times the class is taken into the field to observe insect pests at work. It is planned to expand this course by the addition of one period of two and one-half hours per week of laboratory work in economic entomology, which shall be taken in connection with the lectures of the second half-year.

It is obvious that in a course consisting so largely of lectures, the imparting of information plays a more prominent part than does the giving of scientific training. But the latter element is not lacking. The lectures are so planned that the student in preparing for the required examinations, which come at frequent intervals, must obtain some conception of the foundation principles of the science. And in the laboratory work, where the more general features of the structure of insects, both external and internal, are studied, and where a large number of specimens are classified, the student is given some training in accurate observation.

Third, regular students specializing in entomology. It is for this class of students that the greater part of the work offered by the department of entomology has been planned. All of our courses, with the single exception of the course designed for the special students, is open to them; the only restrictions being that certain elementary courses must be taken before advanced courses in the same field can be elected, and a year's work either in general biology or in zoölogy is a prerequisite for regular work in entomology.

In all of the courses taken by this class of students, the imparting of

information is subordinated to the giving of a training that shall enable the student to ascertain facts for himself. Much more attention is given to laboratory and field work than to lectures. Thus at the outset, these students when taking the introductory course on general entomology, described above, take only the lectures, and instead of the "one-hour" (2½ hours actual time) laboratory work, take first a "three-hour" laboratory course (7½ hours per week) in elementary morphology of insects and then a "three-hour" laboratory course in elementary systematic entomology; the two constituting a "three-hour" laboratory course throughout a year.

In this elementary laboratory course the student is held to the performance of his work in the most accurate manner possible for him, and we usually convince him that he can do it more accurately then he thinks he can at first. We care comparatively little for the facts that he learns. It is not much to have learned the more general features of the external anatomy of a grasshopper; but it is a great deal to have worked out these features in a painstaking way. It is here in the performance of this elementary work that is largely determined the kind of a worker that a student is to be. It rarely happens that a man who persists in doing slovenly work here becomes a careful worker later. It sometimes takes considerable time for a student to learn to work in a careful manner, but if he has the right kind of stuff in him he will learn before the end of this year's work. If he does not do so, he is advised to devote himself to some other field of activity. Here, as elsewhere in nature, a thinning-out process is necessary to produce the best results.

I have given considerable space to the discussion of this course, for we regard it the most important course in our curriculum; it is the foundation on which all the other courses rest. Later the student who has been started in the right way needs only to be given the facilities of the laboratory and library and occasional suggestions as to methods of work and interpretation of results.

I will not take the space to describe in detail the more advanced courses. Those who are interested will find them listed in our Announcement of Courses, a copy of which I will append to this paper. A few words, however, regarding the organization of our department of entomology may be of interest.

The work in systematic entomology is under the direction of Dr. A. D. MacGillivray. It includes the elementary work in this field, already referred to, and several special advanced courses. One of these, a three-hour course (*i. e.*, 7½ hours per week for a half-year) is devoted to the classification of the Carabidæ. This family was selected because it contains many genera, and these are separated

by minute but definite characters, the determination of which gives an excellent training in accurate work. It was also selected because it is easy to purchase of dealers sufficient material so that each student can have for his own collection a set of the genera studied. Then there is a five-hour course (*i. e.*, 12½ hours per week for a half-year) on the classification of the Coccidæ; this is a combined lecture and laboratory course, which enables the student to obtain a knowledge of the classification of this important family, and to acquire the ability to accurately determine species belonging to it. There is also a laboratory course on the classification of immature insects, and a lecture course on the literature of systematic entomology.

An advanced lecture course on the morphology and development of insects is given by the writer assisted by Dr. W. A. Riley. This course is supplemented by a course on the histology of insects. This is under the direction of Doctor Riley, and is largely a laboratory course. The students in this course work individually, some devoting much more than the minimum time required, which is three laboratory periods per week throughout the year. It is here that the students get their training in histological methods, and thus lay a foundation for research work in either the morphology or the development of insects.

Courses on the embryology of insects, on the relation of insects to the diseases of higher animals, and on parasites and parasitism, are also given by Doctor Riley. The last two courses are taken by many students in the Veterinary College and by premedical students in the College of Arts and Sciences.

The work in economic entomology is under the direction of Professor Glenn W. Herrick, and consists of both elementary and advanced work in this field. The work in the morphology of insects and in systematic entomology, taken in other divisions of the department of entomology, is here supplemented by a course in advanced economic entomology and insectary methods, in which the student is trained in the technic of breeding insects, mounting of specimens, insect photography, the preparation and application of insecticides, and other details of insectary work.

In the courses on limnology, which are given by Dr. J. G. Needham, and which treat of the life of inland waters, much attention is given to the study of aquatic insects, and especially to their ecological relations to each other and to other aquatic organisms. A considerable part of this work is carried on at a biological field station, located in the midst of the marshes at the head of Cayuga Lake, and easy of access from the University; so that the work can be continued during the college year as well as in the summer.

Fourth, graduate students. The work of each graduate student is

planned for him individually; and the nature of it is determined by his needs and attainments. Usually this work is largely research; and it is expected to be independent and original. All of the facilities of the department and of the university library are placed at his disposal. He is given advice as it is needed; and is required to make frequent reports on the progress of his investigation. When these reports are made, the results obtained are carefully scrutinized, and frequently suggestions are made as to methods of attacking the problem other than those already employed. But the constant effort of the instructor is to teach the student self-reliance. The completed thesis must be satisfactory in style and composition; and if illustrated, as is usually the case, the illustrations must be suitable for publication.

At the final examination the student is examined not merely on the subject of his thesis, but also on the fields in which his major and minor subjects have been taken. A major and one minor are required for the Master's degree, and a major and two minors for the Doctor's degree. These subjects must be in different fields, under the direction of different teachers. The obvious object of this requirement is to prevent too narrow specialization.

There is space merely to refer to a course in German entomological reading, a course on the morphology and classification of the Arachnida, and to the entomological seminar which meets weekly for the discussion of current entomological literature, and at which advanced students present the results of their investigations. Much is made of this feature of the seminar, as, by means of it, the entire department can keep in touch with the more important work done by the different members of it; and the students presenting papers get experience in public speaking. At this seminar the members of the staff of the department also present the results of their investigations.

In conclusion, I wish to say a word about undue specialization in entomology. Frequently young men come to us who wish to study only entomology, and sometimes those even who wish to devote themselves to the study of a single order of insects; such specialization is never permitted. Usually such students need one or two years' study of languages and of other sciences than entomology to fit them to take up special entomological work profitably. And even when they are fitted to take up this work, it is not best for them to devote themselves exclusively to a single division of the subject. For example, the man who is fitting himself to be an experiment station entomologist should study insect morphology and systematic entomology as well as economic entomology. As "the worst weed in corn may be corn" so a too exclusive study of entomology is the poorest kind of preparation for an entomologist.

Appendix

The course for special or short-course students is No. 16 in the following list of courses.

The courses for regular students not specializing in entomology are Nos. 3 and 8.

The *introductory* courses for regular students specializing in entomology are the lectures of Course 3, and Courses 4, 5 and 8. Any or all other of the courses (except Course 16) may be elected by these students.

Biology

1. **General Biology.** Throughout the year. Three hours. Lectures (2) T Th, 10. *Auditorium.* Practice (1) M T W Th or F, 2–4:30 or S, 8–10:30. *Main 302.* Assistant Professor Needham, Professor Comstock, and Messrs. Matheson and Lloyd.

Prerequisites. None.

This is an elementary course designed to acquaint the general student with the main ideas of biology through selected practical studies of the phenomena on which biological principles are based. Both lectures and laboratory work will deal with such topics as: the interdependence of organisms, the simpler organisms, organization and phylogeny, oögenesis and ontogeny, heredity and variation, natural selection and adaptation, segregation and mutation, the life cycle, metamorphosis and regeneration, and the responsive life of organisms. The object of so general a course is to give a bird's eye view of the biological field and an elementary acquaintance with the principles of development.

This course and Entomology 22 and 23 may be taken to meet the requirement of biology for entrance to the Medical College.

Entomology and General Invertebrate Zoology

(1. **Invertebrate Zoology.** Not given by this department in 1910–11. See Course 1 in Department of Vertebrate Zoölogy in the College of Arts and Sciences.)

2. **Morphology of Invertebrates.** Either term. Two or more hours. Lectures, none. Practice by appointment. *Main 301.* Assistant Professor MacGillivray.

Prerequisites. None.

The comparative study of the anatomy of representatives of the principal groups of invertebrates.

3. **General Entomology.** First term. Two or three hours. Lectures (2) M W, 9. *Main 392.* Professor Comstock. Practice (1) for those who have not had Courses 4 and 5, Th or F, 2–4:30. *Main 301.* Assistant Professor MacGillivray.

Prerequisites. Biology 1 or Zoölogy 1.

Lectures on the characteristics of the orders, suborders, and the more important families, and on the habits of representative species. The practical exercises include a study of the structure of insects and practice in their classification.

4. **Elementary Morphology of Insects.** Either term. Two or three hours. Lectures, none. Laboratory open daily ex. S, 8–5. *Main 391.* Assistant Professor W. A. Riley and Mr. ———.

Prerequisites. None.

An introductory laboratory course, required of all students planning to do advanced work in the Department of Entomology.

5. **Elementary Systematic Entomology.** Either term. Three hours. Lectures, none. Laboratory open daily ex. S, 8–5. *Main 301.* Assistant Professor MacGillivray and Mr. ———.

Prerequisite. Entomology 4.

A study of the wing venation of insects and the identification of specimens belonging to the more important orders and families. An introductory laboratory course required of all students planning to do advanced work in the Department of Entomology.

6. **Advanced Systematic Entomology.** Either term. Three hours. Lectures, none. Practice by appointment. *Main 301.* Assistant Professor MacGillivray.

Prerequisite. Entomology 5.

A training course in the identification and interpretation of obscure characteristics used in the classification of insects.

7. **Histology of Insects.** Throughout the year. Three or more hours. Lectures (1) first term, Th, 11. *Main 392.* Practice, either term, by appointment. Assistant Professor W. A. Riley.

Prerequisites. Entomology 4 and 5.

Designed for students of general zoölogy, as well as for those preparing for research in insect morphology.

8. **Economic Entomology.** Second term. Two hours. Lectures (2) M W, 9. *Main 392.* Assistant Professor Herrick.

Prerequisite. Entomology 3.

Discussion of the more important insect pests and of methods of controlling them. At opportune times the class will be taken into the field to observe insect pests at work.

9. **Advanced Economic Entomology and Insectary Methods.** Second term. Two hours. Lectures, none. Seminar, field and laboratory work by appointment. *Insectary.* Assistant Professor Herrick.

Prerequisites. Open only to graduates and to undergraduates who have had Entomology 3, 4, 5, and 8.

Economic problems connected with applied entomology, discussed, reported upon, and field observations made. Experimental methods in breeding, photographing, investigating, and controlling insects discussed and studied. Designed for advanced students in entomology who desire to fit themselves for Experiment Station work.

10. **Classification of the Coccidae.** Second term. Five hours. Lectures (1) by appointment. Practice by appointment. *Main 301.* Assistant Professor MacGillivray.

Prerequisite. Entomology 6.

A course designed to familiarize the student with the more injurious species of scale insects, the methods of preparing specimens for study, and the systematic arrangement of the species.

11. **Morphology and Classification of the Arachnida.** Either term. Three or more hours. Lectures, none. Practice by appointment. Professor Comstock and Miss Stryke.

Prerequisites. Open only to graduates.

12. **Morphology and Development of Insects.** Second term. Two hours. Lectures (2) T, Th, 9. *Main 392.* Professor Comstock and Assistant Professor W. A. Riley.

Prerequisites. Entomology 1, 3, 4, and 5. Students are advised to take Entomology 7, also, before taking this course.

14. **German Entomological Reading.** Either term. One hour. W, 7–9 p. m. *Main 391.* Assistant Professor W. A. Riley.

Prerequisites. Open only to advanced students in entomology or zoölogy.

16. **Elementary Economic Entomology.** First term. Two hours. Lectures (2) T, Th, 9. *Main 392.* Assistant Professor Herrick.

Prerequisites. None. A course designed for special students. Not open to students who are prepared to take Entomology 8.

Discussion of insect pests in general, with remedial suggestions. Occasionally, the class will be taken to the field to observe insect pests at work.

[17. **Literature of Systematic Entomology.** First term. Two hours. Lectures (2) W, F, 8. *Main 392.* Not given in 1910–11. Assistant Professor MacGillivray.]

Prerequisite. Entomology 5.

A systematic study of bibliographies, indexes, and general entomological literature; the preparation of catalogues of insects; the evolution of the rules of zoölogical nomenclature; and the methods of determining the priority of generic and specific names.

[18. **Embryology of Insects.** Second term. One hour. Lectures (1) Th, 9. *Main 392.* Not given in 1910–11. Assistant Professor W. A. Riley.]

Prerequisites. Entomology 3, 4, and 5. Alternates with Course 12.

19. **General Limnology.** Second term. Three hours. Lectures (1) at an hour to be arranged. Practice (2), laboratory or field work T, 2–4:30, and a second period by appointment. *Main 302 and Biological Field Station.* Assistant Professor Needham and Mr. Lloyd.

Prerequisites. Open only to students who have taken or are taking General Biology 1 and Entomology 3.

An introduction to the study of the life of inland waters. Aquatic organisms in their qualitative, quantitative, seasonal, and ecological relations.

20. **Research in Limnology.** Throughout the year. Three or more hours. Practice by appointment. *Main 302 and Biological Field Station.* Assistant Professor Needham.

Prerequisite. Entomology 19 or its equivalent.

A course consisting of laboratory and field work.

22. **Animal Parasites and Parasitism.** First term. Two hours. Lectures (1) T, 8. Practice (1) M or T, 2–4:30. *Main 392.* Assistant Professor W. A. Riley.

Prerequisite. Must be preceded or accompanied by Biology 1 or Zoölogy 1. Entomology 3 is also advised.

A consideration of the origin and biological significance of parasitism, and of the structure, life-history, and economic relations of representative animal parasites.

23. **The Relations of Insects to Disease.** Second term. Two hours. Lectures (1) T, 8. Practice (1) T, 2–4:30. *Main 392.* Assistant Professor W. A. Riley.

Prerequisites. Must be preceded or accompanied by Biology 1 or Zoölogy 1. Entomology 3 is also advised.

Considers primarily the agency of insects and other arthropods in the causation or the transmission of diseases of man and animals.

24. **The Classification of Immature Insects.** Second term. Two hours. Lectures none. Practice (2) by appointment. *Main 301.* Assistant Professor MacGillivray.

Prerequisite. Entomology 5.

A course in the taxonomy of nymphs, larvæ, and pupæ.

27. **Research in Morphology of Insects.** Throughout the year. Three or more hours. Lectures, none. Laboratory open daily ex. S, 8–5, S, 8–1. *Main 391.* Professor Comstock and Assistant Professor W. A. Riley.

Prerequisites. Entomology 3, 4, and 5.

Special work arranged with reference to the needs and attainments of each student.

28. **Research in Systematic Entomology.** Throughout the year. Three or more

hours. Lectures, none. Laboratory open daily ex. S, 8–5, S, 8–1. *Main 301.* Professor Comstock and Assistant Professor MacGillivray.

Prerequisites. Entomology 3, 4, 5, and 6.

Special work arranged with reference to the needs and attainments of each student.

29. **Research in Economic Entomology.** Throughout the year. Three or more hours. Lectures, none. Laboratory and field work by appointment. *Insectary.* Professor Comstock and Assistant Professor Herrick.

Prerequisites. Entomology 3, 4, 5, and 8.

In most cases it is impracticable to complete an investigation in this subject during the college year. Students must arrange to conduct their observations during the growing season.

Seminar. Throughout the year. Monday, 4:30 to 5:30. *Main 392.*

The work of an entomological seminar is conducted by the Jugatæ, an entomological club which meets for the discussion of current literature and of the results of investigations. Attendance at the meetings may be counted as laboratory work.

PRESIDENT SANDERSON: The next paper which was prepared by Dr. H. T. Fernald will be read by Dr. Back.

PRESENT METHODS OF TEACHING ENTOMOLOGY

By H. T. FERNALD, *Amherst, Mass.*

In teaching entomology, much depends upon the ultimate aim of the student. A course in introductory entomology, whether as a required or an elective subject is sure to include many students who will not continue the subject farther. It is at least probable, that these students will form over half of the class, and accordingly, the introductory treatment should be arranged on the basis of the greatest good to the greatest number. This will usually mean some slight knowledge of insect anatomy, particularly external anatomy, and a general survey of insects as a group, with special attention to the pests of greatest economic importance in the region where the majority of the students taking the course are likely to settle, together with a rather careful consideration of methods for the control of these pests, and with field work, so far as possible, which shall enable the students to recognize them and their work.

The advanced work, following the introductory course, would naturally be for those students who wish to make entomology their profession, or who wish to use it as collateral knowledge in other lines of work, such as fruit growing, forestry, market gardening, etc. Under such conditions, a course best adapted for one, might be far from the best for the others, and it would seem that an important point to keep in mind is that the course should have elasticity. Certain portions of

the work should be common to all, while other parts should be radically different, in order to best meet the needs of the different students. This means individual training, and I cannot too strongly urge that the best results come from a careful study of the plans of each student, and the shaping of quite a part of his work with direct reference to those plans.

For those not intending to make entomology a profession, but who wish to be able to recognize, or if this is impossible, to determine insects which they may find attacking the crops they raise, the course should aim to teach the student how to obtain the answers to the questions which will so often arise in his work—"What is this pest, and how can I control it?" External anatomy, therefore, so far as this is necessary for the identification of insects is essential, and the writer has found that the most satisfactory way of teaching this is by the careful study of the external structure of a rather typical insect of each of the more important economic groups, followed by the identification, at least as far as families, of quite a large number of insects. The course in external anatomy should assure the familiarity of the student with those parts used in analytical keys, while the determinative work to follow, will call his attention to variations in these parts, besides giving him practice in the use of the keys themselves.

It seems to the writer that too little attention has been paid to the question of insecticides, in connection with this work. He gives, and is heartily in favor of quite an extensive course of lectures, together with as much laboratory work as is possible, on the different insecticides, their chemical composition, preparation, methods of detecting adulterations, etc., and this course could be extended with profit.

Beyond this point, however, he believes that the work of the students should be, to a large extent, individual, and that the man going into fruit raising for example, should make a careful study of the insects most seriously injuring the fruits he expects to raise, both in the field, in the laboratory, in the collections available, and in the books. Of course, within the ordinary time limits of such a course, it is impossible to cover all the insects of any crop in this way, but the more important ones can be considered, and the man will thus be enabled to recognize the most important pests or their work, when he may find them, and take active measures at once for their suppression.

In this way, the student who receives the training outlined above, will recognize many of his insect enemies without study, but if this is not the case, he knows what steps to take, in order to ascertain the foe which is attacking his crops, and having determined this, is in a position, as the result of his studies on insecticides and other measures of control, to utilize the best methods for its destruction.

For the student who expects to make entomology his life work, the problem is somewhat different. Such a man must know all the important insect pests, and be able to identify those which he may not recognize. He must thoroughly understand the various methods of controlling these insects, and must be able to successfully raise insects through their early stages to the adult condition, in case a pest can not be recognized until it is adult. In other words, he should understand how to do systematic work, life history work, and how to conduct methods of treatment, and this should not be knowledge gained from books or in the lecture room alone, but by practical experience. And it is here that the difficulty of adapting collegiate sessions to entomological work appears. Structural and systematic work can easily be conducted during the winter, and methods of treatment, to a slight extent, can also be undertaken at this time, but the larger part of all field work, which is so important, must either be begun so near the end of the spring term that the student leaves before it has been completed, or must be undertaken entirely during the summer vacation, when he is not ordinarily available. Under such conditions, the only substitute is to give as thorough a training as possible along the lines of external anatomy already indicated, and in the systematic determination of insects, and then as much as possible in the other lines, and it is an interesting comment that correspondence with a large number of men trained in this way, who have been out of college for some time, shows that they feel that they are weakest, not in methods of control, nor in life histories, but in their ability to identify the insects with which they have to deal, and they frequently state in the correspondence, that in their work, which is largely economic in its character, they feel the need of more extensive systematic training.

How much of this it is possible to give within the limits of an undergraduate course, will naturally, of course, depend upon the amount of time allotted to the subject, and this is something that is rarely in the hands of the teacher in charge. A college course, as laid out by a college faculty, is usually more or less of a compromise, and while the elective system in the last years, permits of some specializing, it is at best, specializing within a certain group of subjects, rather than in any one. Perhaps this is a good thing in some ways, for the broader the foundation in college, provided the man is able afterwards to specialize, the better will be the results, and Agassiz's remark to his students at Penikese, "Learn something of everything, and everything of something," is still in the opinion of the writer, a fundamental principle.

In too many cases, however, the college course, which, from this standpoint, should be the place to learn the "Something of everything," is the last opportunity for training, and if we attempt to crowd

into this four years the "everything of something," as well, the results are liable to be unsatisfactory in both directions. For the intending graduate student, therefore, I would urge a broad undergraduate course, with plenty of chemistry, physics and botany, but with sufficient attention paid to the cultural subjects, and those connected with our duties as citizens, to give breadth in every way. Languages as tools, aside from their cultural value should not be omitted. and if such a course as this for the future graduate student in entomology must mean a reduction in the amount of undergraduate entomology which he could take, I would still advise such a course, believing that the concentrated study of the one subject to follow after graduation would be much more valuable when placed upon such a foundation.

Starting with this, the graduate student is in a position to go ahead rapidly. I hardly think it comes within my province to discuss lines of work for graduate students, but if we remember that after completing his course, he will be expected to have personal experience in methods of control, methods of rearing insects and in identification, it would seem desirable that these three lines of work should be given great stress in his training, and at the Massachusetts Agricultural College, it is the present purpose to recognize this by requiring an original piece of research in each of these three lines, to constitute the thesis, rather than one piece of work, perhaps three times as large. The student may get out a splendid thesis, well worthy of an advanced degree, on the median segment for example, requiring nearly all his time for three years to prepare, but it is probable that one of the first questions he will meet on taking a position thereafter, will be as to the relative merits of two different brands of arsenate of lead for spraying. Under such conditions as these, the writer favors what he may term the tripartite thesis.

In conclusion, an opinion cannot be too strongly expressed as to the amount of supervision to be given graduate students. The idea of letting a graduate student "work out his own salvation," without any supervision is, in the opinion of the writer, a serious mistake. The average student on graduation has been so carefully led by the hand and guided for four years, that he really does not know how to take a step by himself. Of course, he will learn, but even the best man loses much time and often gets discouraged in this process. It would seem wiser to begin graduate work under much the same supervision as that given to undergraduates, but to gradually reduce this, so that after six months or so, a man is generally working for himself. Thus, the time and money of the student are saved, greater progress is made, and the great change from the nature of undergraduate work to that of graduate work is successfully bridged over. In this way, the stu-

dent loses no time, and can make his advanced work more satisfactory and more profitable than would otherwise be the case.

PRESIDENT SANDERSON: Professor Osborn will present the next paper.

THE PRESENT METHODS OF TEACHING ENTOMOLOGY

By HERBERT OSBORN, *Ohio State University*

In a discussion of the methods of teaching entomology, it is almost necessary to take a hasty view of the growth of the subject and of the different methods of imparting knowledge in it during the past half century. We need scarcely go back of this, because for the United States, at least, the growth of the teaching of entomology as a subject included in a college curriculum has had its growth within that time. In fact, practically all of the development of the teaching outside of two or three localities has been within the last twenty-five years. Naturally the methods in vogue in the early teaching of the subject were derived from the teaching of related subjects such as Botany and Geology, but even for these the different programs of instruction were in a very crude form up to thirty or forty years ago. The growth of the methods of teaching has necessarily followed the growth of the subject as an application for economic purposes as well as for the impartation of knowledge as a science. Naturally, then, for the teaching of Economic Entomology the development of methods must have been within very recent time.

The early plan of teaching was quite naturally that of the lecture system, partly because of the scattered condition of the material and lack of definite texts in the science, and partly because of the prevalent idea that the lecture system was the most satisfactory and, perhaps, the least troublesome to the teacher. Later, however, this was combined with more or less of field work, and then with some laboratory courses, and at the present time the method which I suspect is the most general is a combination of these various methods; that is, more or less of the lecture system including illustrations by chart or lantern, or collection incorporated in class work, along with text references and quizzes. These associated with definite laboratory courses, with dissections of typical forms, and a definite allotment of field work involving the collection of material in its natural habitat, its preparation for preservation, and more or less of identification for the practice in systematic work. These methods, of course, vary with regard to

the preparation of the students and the progress they have made in their studies. For more advanced work it includes the most precise methods of microscopical study and all of the refinements that have been evolved with reference to the study of minute anatomy and the special methods of field research to determine ecologic conditions.

Entertaining lectures about insects or insect habits, while they may still have value as inciting interest in the subject, but which are largely forgotten at the end of the term, go a very short distance in the way of effective training for exact scientific work in entomology. This must come by continued and concentrated individual application. It can be stimulated but not accomplished by the efforts of the teacher.

At present we may consider that there are at least three phases of the teaching of the subject to be considered: First, the instruction given in scientific institutions, and especially with reference to the training of investigators or teachers who expect to follow the work from a professional standpoint; second, the instruction given in agricultural colleges or other schools especially for the purpose of giving information to those who will use it in the application of measures of control for the insects with which they have to contend in their daily life work; and third, the instruction which is now becoming an important feature given in the shape of extension courses to people outside of college and school environment, and which takes the form of lecture work in the extension course or the publication of instructive matter in agricultural journals or other media of publication.

It is evident that the methods available in these different lines of instruction must vary, and that while each has its very important place, the effort should be to adopt methods which will be most effective in the different spheres. This may involve the utilization of teachers of quite different capacity or training, but, nevertheless, it appears to me must involve for each a thorough and accurate foundation in the essentials of the science. As for the necessity of the different lines, it is clear that there can be no definite progress in the matter of thorough training for the two latter groups except as we have the solid basis of fact determined by accurate and prolonged study of the conditions upon which to base the instruction given. There is, therefore, the necessity that we should have trained investigators for the acquisition of further knowledge concerning insects, the discovery of which is one of the most important duties of modern entomology. For the purpose of this kind of instruction it is absolutely necessary that there be thorough training in related sciences, as well as in the general foundation in other branches of knowledge. It appears to me that the work in this line should naturally be built upon as thorough a foundation as required for advanced training in any line of knowledge. Ento-

mology is distinctly a special branch of science, and in order to secure a breadth of view or to acquire for it the proper outlook, it should not be entered upon, at least for its special features, until the student has been thoroughly grounded in those branches of knowledge which he must use in the furtherance of his work. I believe that a thorough course in zoölogy should by all means precede the special study of entomology, and if with this there can be extended work in botany and geology, as well as chemistry and physics, the student is so much the better qualified to secure a proper perspective and to accomplish effective work either in investigation or instruction.

The equipment for the teaching of this subject is pretty well established, and there is I think considerable agreement in the different institutions where the subject is seriously taught. In practically every institution which I have visited recently I have found that there is a full recognition of the necessity for a collection of insects which shall be representative of the different orders for service as a basis for the identification of species, and where advanced work is attempted, serve for the investigation of various groups and sometimes for theses on monographic subjects. That collections in entomology should be even more essential than in general zoölogy is quite a natural result of the immense numbers of species with which we have to deal, and the fact that specific recognition is such a fundamental necessity in the proper handling of economic as well as of morphologic problems.

Equally important with the collection is the equipment of apparatus, microscopes, etc., which are essential in the detailed anatomical and morphologic studies, and with these there will be in all cases a necessity for facilities for the tracing of life histories and the study of problems of development. Just how far this matter shall go is evidently a question of opinion, or in some cases a question of resources, since the building of elaborate insectaries is a matter of considerable expense. That there shall be some provision for controlling the conditions and facilitating observation in life histories is granted, but it is evident that very much in the way of thorough training can be done in the field, and with moderate equipment in this direction.

I have had an opportunity to visit a large number of institutions where departments of Entomology were at work, and it has happened in a great many instances that the insectaries have just at the time of my visit been unused because the problems on which the entomologists were engaged were being conducted from the field and laboratory standpoint. This has occurred so frequently that I have been somewhat puzzled to know whether the insectaries furnished so much of advantage as they were expected to, but nevertheless I am very free to grant that there are many problems in which they must be of great

service, and both for instructional purposes and investigation must have a place. For the purpose of instruction I am inclined to think that they will be of the greatest service in connection with work laid out for advanced students, and that for the more elementary students better results can be obtained by field and laboratory methods.

The extent to which a department must be provided with books and such accessories is one in which I think we shall all agree that the more that can be secured the better, but I do not feel that any department need neglect the subject because of a scant equipment in this direction. If students are forced to go more directly to the subjects themselves there is certainly some advantage, although the access to extended literature is helpful, and for some subjects, absolutely indispensable.

The other element in the problem, and the most fundamental one of all appears to me to be the teacher, and here it is difficult to make any very specific statements. In the earlier development of the subject it seems to me that a great deal more depended upon the individuality of the teacher than at present. So much depends upon the stimulus given to the student as to his effective work that in the earlier development of the subject it was very largely a matter of this individual work. At present a student may acquire his enthusiasm from a number of associated workers and fellow students, as well as teachers, or be stimulated by the recognition of the fact that there is a distinct demand for workers in this field. My own feeling is that students should be given as great a freedom of action as possible, and that especially after they have entered upon advanced work the teacher should occupy the position of a helpful guide rather than that of a dictator in the work. A student who does not have enough interest and enthusiasm in the subject to work independently, or who does not have enough independence and originality in his work to go beyond the outlines furnished by his teacher, is in most cases hardly worth the extended effort of the teacher. If he is too distinctly directed in this course he will fail to branch out into lines which will be a means of growth to himself or of distinct advantage in the progress of the science.

As a concrete example of the courses of study in this line, it may be permissible for me to outline briefly the courses offered in my Department, with some hints as to the purpose and method in each.

The work in the College of Agriculture for four-year students begins with a year of general zoölogy, including considerable attention to economic phases of the subject and embracing a discussion of the group of insects, with indication of the orders, some life histories and habits, with certain applications for injurious forms.

This course is followed by a year of general economic entomology, which is intended primarily as a course to give the elements of the subject in a broad way, but informing the students as to the divisions of the group, the principal phases of life cycles, especially those which are at the basis of measures for control, to discuss remedies, use of insecticides and apparatus, and in short to put the student where he may intelligently consult the literature of Entomology which is available in experiment station and other entomological reports and apply practical modes of treatment. The course includes for class work, lectures, quizzes and examinations, with laboratory work devoted to the dissection of typical examples in the different orders, carried far enough to give some acquaintance with both internal and external structures, and particularly with such structures as are at the foundation of classification. Students are also required to collect and prepare a representative series of insects with classification carried far enough so that they become acquainted with the various divisions used in this work.

Such a course, we believe, is fitted to prepare a student not only for the general work which may follow in any field, but also to furnish a basis in case he determines by this time that he wishes to go further into the subject, or to make it his profession.

For advanced courses the student may start at the beginning of his third year in college by taking advanced entomology based upon the two years of preceding work, and for this course there is given a thorough review of the anatomy, physiology and development of insects with special attention to the phases of metamorphosis, or life cycles and adaptations which constitute such a very important basis for the problems of control. The scientific basis for methods of applying insecticides, the use of apparatus and the application of cultural methods, use of parasites, diseases, etc., are fully discussed. It also includes a practical study of the scale insects intended to cover an important economic group and as giving training in the technique and taxonomy of a group. In this connection also we usually discuss the questions of legislation, quarantine, inspections, etc., with, later, the selection of some particular group or species upon which a more exhaustive study is made. Such a study serves as a training in the use of entomological methods and to give a greater familiarity with apparatus, collections and library. Following this course which has occupied a year, a student may engage upon a year of special research work devoted to a particular problem. This may be taken in connection with a course in invertebrate embryology covering the various phases of development in the invertebrates at large with a considerable time in the study of the embryonic development of insects.

There is also a course in invertebrate zoölogy which is open to election and which may be taken either before or in connection with the course in advanced entomology. This course, dealing with invertebrates in general and devoted to morphology, relationships and life histories, serves to give a broad knowledge of the phases of invertebrate life and to form a better basis for acquaintance with insect structure and development. It embraces especially dissections, microscopical studies and special technique in preparation of material for study.

Advanced students are also expected to carry a course of seminary work, which includes reports upon current literature, reports upon the personal study of the student, or the discussion of such special scientific topics as may be of special interest during the time in which the course is running. This enables the student to gain practice not only in the preparation, but in the presentation of results in his work. For graduate students there is a requirement for the preparation of a thesis in which the student does practically all of the work which is common in the preparation for publication of an exhaustive scientific paper.

For the more elementary training there is offered a course to students of the short course, and others who have had no training in zoölogy, this course running through one year and being taught in a more elementary manner, simply on the basis of a lack of knowledge of general zoölogy. It aims to give an acquaintance with the groups of insects, especially those which are of economic importance, a study of the measures of control, and an effort to acquaint them with so much of the technique of the subject that they can intelligently use the reports of experiment stations and other general publications.

It appears to me that something along this line is the most essential thing to provide in the courses presented at institutes or in extension work, because there is certainly a considerable gap between the average cultivator and the entomological literature presented in agricultural journals, station bulletins and other published material. Whatever can be done to reduce this gap, to make our knowledge available to the public at large, is not only a desirable but an essential thing for the progress and utilization of economic entomology.

Considering the immense changes which have taken place in the teaching of entomology in the last quarter century and the rapid movement at the present time, it is certain that marked changes will occur in the future years, and probably one of the desirable things at the present time is to indicate if possible the lines along which such development may occur, or to suggest features of improvement. Otherwise, I take it this symposium would have no particular object.

It appears to me that there is need of still further specialization in

the work of presenting entomological matter, and that there must be naturally a larger division of the subjects of entomology, so that certain phases of it may be presented by those who are most thoroughly equipped for the purpose. The time is evidently past when all the different branches of entomology can be presented thoroughly by a single individual. While it is desirable for the sake of sympathetic action and coöperation that each one should be acquainted with the lines of work engaged in by others, for the sake of real progress it is necessary that each one should restrict himself in special work to a limited branch. This means a differentiation into systematic, morphologic, physiologic, embryonic and ecologic groups at least, and it is hardly possible to speak of any one of these as being of greater importance than the others. Systematic work is absolutely essential for accurate indication of the forms on which work is done, and it in turn must be based on thorough acquaintance with structure and development. An acquaintance with the physiological activities must, I think, grow greatly in importance as the development of experimental work toward the control of insects is developed. At first sight knowledge of the early embryonic stages may seem less important than post embryonic development, but it has become more and more apparent that many problems which have ultimate economic importance are wrapped up in this phase of the subject.

In addition to these there are the special fields of medical entomology and of behavior which have developed into quite important subjects within the last few years. Both of these may be taught in connection with other more general matter, and on some accounts it appears to me that this is much the better plan, since it is then possible to preserve the practical relationships which are an important thing for the student to secure. Medical entomology, however, has been making such strides and is becoming so distinct a branch, that it may require more special treatment. It was noticeable in the Congresses held during the past year that one of the most prominent topics for discussion was the relation of zoölogy and entomology to medical science, and there were some very urgent pleas that these be given a greater measure of attention. Experimental zoölogy has also considerable to offer in the way of particular treatment, and is doubtless to be reckoned as one of the important lines for development. Here again, however, it appears to me that there is some advantage in the close association of this work with the more general work upon life histories and habits, and I am not sure that the advantage to be derived from close specialization in the subject will outweigh the loss from its separation from the more general phases of the subject.

It is very evident indeed that much of this matter will specialize

largely in the future. This will make it more and more difficult to completely cover the important phases of entomological work in one place, and will, I think, further require a greater amount of migration of students who wish to get the latest and best of methods in any particular branch. Such a migration of students, already somewhat in vogue, is, it seems to me, a very desirable feature both for securing a broadening effect upon the student from working with different individuals, and for the stimulating effect it has upon the instructors themselves.

With regard to the teaching of entomology in the lower grades of school work, there seems to me to be a distinct problem and one that is deserving of most careful attention. Under the name of Nature Study and other terms considerable of this work is already in progress or is being urged with greater or less force. It is a subject which interests the economic entomologist particularly, because the education of the general public in some of the fundamentals of the subject would permit him to make his results known with much greater facility. I have heretofore, in an address before this society in Boston twelve years ago, indicated the belief that it would be unfortunate to force such work into the lower grades of school work before we have teachers sufficiently trained to give the work with a fair degree of success. It appears to me that to force such work in with incompetent or uninterested teachers would simply delay the longer the practical adoption of such work, and therefore be an unfortunate feature for entomological science. It seems to me necessary that accurate knowledge in such lines should be carried from the higher grades of school work downward, and that as soon as a fairly sufficient body of teachers is available, the extension of such work into the lower grades will be practicable. This period should be much nearer to us at the present time than it was a decade ago, as there has been a very extensive growth of interest in such work, and a large body of teachers more or less trained for the handling of such a subject. It is still a fact, however, that many of the teachers attempting such work have more enthusiasm than knowledge, and are no assistance in the real extension of interest. These conditions will undoubtedly improve rapidly as the subject becomes more widely understood and the demand for such information increases from the outside. There is so much at present being presented in the general magazines, in agricultural literature, and in the form of accessory school work, that it can be only a question of time that greater efficiency will follow.

PRESIDENT SANDERSON: Professor Bruner will present the closing paper.

PRESENT METHODS OF TEACHING ENTOMOLOGY AT THE UNIVERSITY OF NEBRASKA

By Lawrence Bruner, *Lincoln, Neb.*

When our Secretary sent out his preliminary notification of this meeting and asked me to take part in a discussion of "present methods of teaching Entomology," the matter at first seemed of little importance so far, at least, as the speaker was concerned. However, after giving the subject some thought I have decided that it might be well at least to take the time and trouble to attempt to explain briefly a few of the methods by which the student in Nebraska is enabled to absorb some entomological information. In order to do this with an unbiased feeling it might be well as an introduction to state that the speaker began his work as Experiment Station entomologist with the explicit understanding that no teaching was to be required of him. During the twenty-two years and over since becoming connected with his present position matters have changed somewhat. Today the greater portion of the time of the entomologist, during the school year at least, is taken up with instructional duties. A department of Systematic and Economic Entomology has developed; and, thanks to the grade of students choosing the work, fairly well equipped men have been turned out to take their place among the working entomologists of the country.

It should be strictly understood by my audience also that the speaker does not consider himself a teacher in any sense of the word, neither is he conceited enough to claim any great amount of credit, if credit be due, for the plan followed in making entomologists at the University of Nebraska. The methods, if any exist, have simply evolved. Again if my audience understood the courses offered and the different classes of students who take these courses, it would be an easier matter to describe our method of teaching the subject. Of course in Nebraska as elsewhere not all the students who are obliged to take up entomological studies do so with the intention of becoming trained specialists, neither do they register for the work with the expectation of learning all there is to be known concerning insects. In fact, though I do not like to confess it, many of the students who do register for entomology in our institution, do so under the impression that they are registering for "a snap." Others register because entomology is required in the particular group of studies which they have chosen. A very few students in the beginning have decided that they would like to take entomology for its own sake, but none choose the study of insects because by doing this they expect to make it the stepping stone to an independent fortune.

After it became evident that some teaching would be required of the station entomologist, a sort of general course was outlined and a series of talks prepared with the object in mind of giving the student some sort of an idea concerning the nature of insects and their relation to man. These talks were at first delivered at irregular intervals and readings were suggested for filling in the gaps. From time to time other information along entomological lines was sought for and attempts made to supply the desiderata. In this manner several distinct courses have been developed so that at the present time the student has an opportunity to select at least a dozen or more distinct lines of work in the department. In the School of Agriculture the entomology offered at present is simply in the form of a series of lectures of the nature already mentioned, and no laboratory work aside from reading is asked of the students. By far the larger number of our students are of this class. It might be well to add parenthetically that even the domestic science girls are obliged to listen to the haranguing of the entomologist hoping that they will learn something about protecting the weary wayfarer from the attacks of certain insect enemies of man and, incidentally, also learn how to fight flies and brush lice off their house plants. It is likewise expected that after having pursued this study they will adopt the most approved methods of catching and killing fleas.

The real entomological instruction, however, begins with a course on general entomology in which the Class Insecta as a whole is reviewed. In this course the professor attempts to outline his talks in such a manner as to describe Arthropod structure, to give information concerning the transformations, distribution and behavior of the various represetatives of the Class Insecta, and to a limited extent of the more nearly related forms; to describe the chief characteristics of the orders, suborders and important families of insects, as well as to mention and describe briefly the life-histories and habits of typical species. These lectures are usually arranged so as to be accompanied by suitable stereoptican views. In connection with the lectures all students who register for this course are obliged to do certain laboratory work, two hours in the laboratory being required for each lecture period. In the laboratory the student is expected to make dissections of typical representatives of the various insect orders and also to try to represent the work being done by drawings. This course in general entomology is planned to meet the demands of both the general and the special student because, since certain of our courses in the College of Agriculture require entomology later on, these general students must necessarily take up different lines of entomological work the basis for which is practically the same. Our special students, however, who intend to make entomology their major subject while in college are handled quite

differently, as will be shown further on. In the laboratory work just referred to only the coarse external structure is studied so as to obtain sufficient knowledge of the anatomy of insects to aid in their classification. In connection with the laboratory and lecture work some readings are required, though not extensive, it being supposed that the lecture notes, if taken down rather fully and studied later on will be of sufficient guidance to the student to enable him to gain the information which it is the instructor's desire to impart. No regular text-book is used till the second semester when the student is advised to secure a copy of either Comstock's Manual or Kellogg's American Insects. The special student, however, is required to study all of the texts he can find the time to examine.

In the second semester of the year the laboratory work is greatly modified. The student is now supposed to learn to discriminate between orders, families, genera and species. In other words, the student is taught to classify insects. He is also supposed to do some field work, this field work to consist of collecting insects, noting something concerning their food-habits, their methods of life, their distribution, and in some instances even to observe life-histories by means of rearing and taking notes on one or more common forms. In his food-habit investigations he is directed to note the difference between carnivorous and herbivorous; he is also led to see the difference between predaceous and parasitic insects. In connection with the lectures for the semester such subjects as "parasitism," insect dispersal or distribution, effects of climate, insect diseases, reproduction, methods of insect control, artificial and natural, etc., are discussed. As my audience may imagine, it is hoped in this manner to make the general entomology a basis for the special work which is to follow later on in the student's college career.

While it would be possible for the entomology student to pursue his morphological and embryological studies in the department of entomology, it has been our custom in Nebraska to have him do this in the department of zoölogy which is better equipped for this class of work. In like manner the department of horticulture is better equipped for spraying demonstrations in connection with the handling of certain fruit and shade tree pests.

In speaking of methods pursued in teaching the special student, it might be well to add that should the student decide before beginning his work in the department of entomology and inform the instructor that he intends to specialize, he would be given additional laboratory work in connection with the study of the insect's body, some internal anatomy in addition to the external structure which is required of the general student. He would also be directed to register in the depart-

ment of zoölogy where he should take a course known as "General Zoölogy." He is likewise requested to take a similar course in botany as early in his college career as possible.

It might be of interest for me at this point to state incidentally that in training students for doing entomological work it has always been the aim at Nebraska to see that our students study such languages as Latin, German, French and, if convenient to do so, also to add at least one semester of Spanish or Italian. We have thought this action on the part of the student to be of much importance since so many of the entomological publications which he must consult during his career as an entomologist are published in these languages, and he should be able to read them in a sort of way at least. In addition to the study of languages and the botany and zoölogy already referred to, we aim to have the special student learn how to construct synoptical keys or tables of the orders, families, genera and species. For the purpose of testing these tables they are put in the hands of first-year students who should be able to determine insects by their aid, and until this is possible, the student is requested to continue to revise He is also set to work on preparing bibliographies of various kinds. These bibliographies deal with such subjects as the insect enemies of some particular order, family or genus; or possibly, they are based on the literature referring to the various insects affecting some special host-plant, or it may be constitutes the literature referring to the insect fauna of some special region.

After having started a student on his road towards specializing in the subject of entomology, although he may be but a second or third year man, it is our custom to have him decide upon and elect some particular group for his more especial study. When he has done this, one of the first things necessary is the gathering together of both the available material and literature. After this has been accomplished he is requested to look over various published bibliographies so as to find and designate the additional literature necessary to be secured by the department in order to enable him to carry on his studies. In the meanwhile he is set to work collecting all such material in the line of specimens of the insects to be studied that it is possible for him to secure. While doing the collecting, if any interesting facts are observed in connection with the specimens being studied, it is required that notes be made describing such characteristics, etc. Later on in the course of his studies these notes are to be used as a basis for papers to be written and which can be used, if so desired, towards satisfying the English department's demand for themes. Occasionally these papers can also be utilized in the local entomological club to which all special students of entomology belong. In this manner the student is enabled

to satisfy, to some extent at least, two or more of his instructors with the same expenditure of time and waste of gray matter.

Reference has been made to the Seminar work in connection with the local entomological club. It might be well to state that all efforts put forth by the student in preparing papers for, and in taking part in, the discussions of this club are recognized by the department of entomology to the extent that regular college credit is given for these efforts. The head of the department, however, reserves the right to criticize and correct the papers thus offered to the same extent that he would papers prepared exclusively for the department.

In teaching the systematic side of entomology our method has always been to start the student out by having him learn to recognize at a glance the orders to which various insects belong. After he has succeeded in doing this fairly well so far as the larger and more easily recognized orders are concerned, he is then required to pick out representatives of some of the principal families of each of them, and later sections of families or genera, and finally species.

In our instructional activities in Nebraska we have attempted to include as much field work as possible. We accordingly have our second, third, and fourth year, as well as graduate students accompany the professor on field trips whenever practicable. This plan, by the way, was the usual custom in earlier years at Nebraska and some of the first students who were trained obtained a very large percentage of their entomological training in this manner. During later years, however, this scheme has been less convenient on account of the lack of facilities for getting out into the state and afield. During the earlier years our railroads were permitted to issue complimentary transportation and the professor of entomology was not averse to accepting as much of this kind as it was possible to persuade the companies to issue. Accordingly many of the field trips in past years lasted for periods varying from a day or two to two or three months in extent and most of the accessible portions of the state were thus reached and more or less carefully studied. This plan of having the student accompany the professor into the field was not entirely a one-sided proposition either; since by the combined energies of many special students, during the numerous field expeditions, there has been an accumulation of a much greater number of facts concerning our insect fauna than could otherwise have been accomplished.

While referring to lectures as a means of instruction it might be of interest to state that we have found considerable value in the use of "startling statements." By "startling statements" is meant references to peculiar structural features as found in certain insects, odd life habits, rapidity of multiplication, location of some of the sense

organs, etc. Such statements in our judgment tend towards working up interest among non-technical students. It is sometimes possible that by such simple methods an occasional non-entomologically inclined student will become aroused from his apathy in "bugs" and "bug lore" and gain an interest sufficient to lead him into life-history investigations on his own account, and later to the adoption of entomology as a study. Of course when once started he will go on and become a "bug crank" of whom it will be said, "When in college he studied and collected bugs" and perhaps in after life choose to occupy some of his leisure time in studying some group of insects as a pastime.

In Nebraska we have seldom obtained our special students by trusting to their coming in and choosing the study by themselves. In most instances our students have been "discovered." Such "discoveries" were made during visits to farmers' institutes, teachers' association meetings or while addressing some of the high schools and other organizations out over the state. We have even "discovered" a few special students through correspondence concerning some of the many insect enemies which are to be met with over the state. Occasionally young men have become sufficiently interested in some peculiar appearing insects that they have come across in their wanderings, or special insect attacks, to write to the entomologist concerning them. In our replies to these letters for information a little ingenuity often creates a desire for further information that leads the young man to begin investigations of his own. After we have learned of such an interest on the part of the various young people, they have often been induced to enter the University and take up studies in this department. In this way we have chosen men who were really interested in the study of nature in several of its branches before they came to us. After the choice was made, and the student had arrived, it then became our duty or at least an effort was made to provide the means whereby the student could pursue the desired studies without permitting him to feel that he was making too great a sacrifice of time and energy. Once the student has entered the department with the intention of becoming an entomologist, and has gone through with his general courses and had a little other training sufficient to be of aid to him while pursuing individual investigations, he is encouraged to take up special or research work. It has been our experience that nearly every young man has in mind some particular line of the work that he would prefer to follow in preference to others. Everything else being equal it would be best, therefore, for him if he could choose in a line with his desire. Should the student choose to specialize in forest entomology he is accordingly encouraged to learn some general prin-

ciples of forestry; if, on the other hand, he has an idea that he would prefer to study the insects that attack fruit and ornamental trees, it is the principle of the head of the department to suggest that he take some work along the line of horticulture. If the student wishes to make a special study of insects in their relations to diseases, then a medical course is prescribed, etc.

In addition to some of the other general requirements of the special student in the department of entomology in the University of Nebraska and which have already been referred to, it has always been insisted by us that he should learn report writing, proof reading, editing, etc.; in fact, he should learn to act as a sort of private secretary to the entomologist by taking dictation and writing many of the economic and other letters of the department. He is also utilized at times throughout the several years of his college course as laboratory instructor, librarian, breeding-cage overseer and to perform such other matters as incidentally come up from time to time in the department, including "janitor work, bottle washing, and cooking," as one student remarked not long ago.

Fortunately in Nebraska it has been possible for the professor who is also the state entomologist to turn some of the special funds which have been appropriated by the State Legislature from time to time, for his use in fighting insects, so as to put them into the hands of these special students by engaging them to assist in the various kinds of field investigations that come up from time to time as well as to pay them for some of the time allotted to the various activities mentioned above. In this manner it was and is possible to keep the student occupied in entomological work during the summer vacation. While perhaps not giving him as much income as he might obtain from other employment, the continual coming in contact with matters entomological in part compensates him for the shortness of the pecuniary compensation.

PRESIDENT SANDERSON: The discussion will be led by Dr. Smith.

MR. J. B. SMITH: Mr. President and Gentlemen: I think we all appreciate the difficulty of discussing this series of papers, where almost every phase of the subject has been treated very thoroughly. There seems to be one agreement on the part of all who have taken up the subject, and that is, the desirability of laboratory work, and as much of it as is possible; and the marvel to me has been, as I have listened to the papers, where in the world the time comes from for college students to do all that is expected of them. Now, I will admit that so far as my teaching is concerned, I have never been able to

secure time to do what apparently has been done by other teachers. The nearest approach to it has been brought out by Dr. Fernald but only incidentally in some suggestions. He said, if I recollect, that it was important that the student should have a good general knowledge, that he should have a good foundation for work, and that if anything had to be cut in the making of an entomologist, the entomology might, in some cases, be cut to good advantage; and now I am not sure but that is true. That a relatively small amount of entomology in the undergraduate course is in itself as good as the devotion of a great amount of time, a number of hours through the entire course, to the neglect, necessarily, of some fundamental study. There seems, also, in all the papers, to be rather an ignoring of what might be called an Eastern college course. The point of view seems to be from the standpoint of a rather mature student, a man who enters the college with the idea of pursuing a certain study, and who has a definite point in view. In our institution in New Jersey the first year is prescribed for all scientific studies; there is no election. The idea is that every man who enters college should have a fundamental training that leads to making a good citizen of him. Entomology does not enter into the course until the second semester of the junior year at all, and for those students that take only the biological course that is all the entomology they get, and that is all that they have time for. Now we work our men six days in the week—five full days, morning and afternoon, and more or less the sixth day, and they work from nine o'clock in the morning—some of them consider chapel work, too—and until four o'clock, and some until five o'clock. That is a long enough day for a college student, and if taken thoroughly, is all he can do. In that first semester, or rather the semester in the junior year, both the biological and agricultural students are placed on the same plane, and the object in that course is to teach them something about the structure and the general classification of insects; the relation of insects to other animate nature,—that is their place in nature, and as the course is developed, a considerable amount of time is given to diseases, both of plant and animal. A great many of our men who take the biological course do so as preliminary to a medical course. We do not aim, in our institution, to turn out trained entomologists. Those students who pursue the agricultural course have not the time; agriculture in its broad sense will take up the time of any man for four years if he wants to pursue it, and leave only a small margin for entomology. In the last half of the senior year the agricultural students get a training in economic entomology, but that training is not enough at any time to turn out a man who is ready to take a position for entomological work.

In planning the course I have distinctly eliminated the idea of training men to take positions in entomology. I have advised men who have taken the course with me, and who have wished to specialize in it, to go somewhere else for the postgraduate course, particularly because I think it would be better for them to get a different view point, and partly because of the multiplicity of duties that fall upon the entomologist, and really make it impossible for him to give a good postgraduate course, so that I have not had a single postgraduate student, and am not looking for any. I have not turned out more than one or two men that have followed entomology, and that have made a success of it. I do not consider myself a failure as a teacher, because I have turned out a good many other men who have done good work, and whom I meet occasionally, and who remember the instruction received from me. Now there is one point that was not brought out, except in a very incidental way, and I think possibly Professor Bruner referred to it, and that is, that in the course of laboratory work a teacher can do an enormous amount of teaching while watching the boys in their work, talking to them and telling about the relation of the insects to other subjects, and doing it without the formality that a lecture implies, and then suggesting to them that in making their notes they also incorporate as much as possible of what has been told them. Their own work is always easily separable from what they remember having been told. I have been extremely interested in the papers, and yet not a single one has touched the case as it lies in my own institution, and where, as I think it may be possible in other institutions, we are not able to take the students out for field work. Naturally the situation of an institution has a great deal to do with the manner in which the natural sciences are taught, and especially so in entomology. We have always plenty of material to work with, but it is mostly material that has been collected for the students, and they have very little opportunity of going into the field, although they get some chance in my department and in the horticultural department to do practical work in spraying. I follow Professor Bruner's suggestion in that respect and turn over to the Horticultural Department a good deal of the practical work of spraying.

SECRETARY BURGESS: I wish to say in regard to arranging for the symposium, that I asked Dr. Bethune and Dr. Wheeler to take part. Dr. Bethune wrote that he could not be here on account of the fact that it was necessary for him to submit to an operation at this time, and Dr. Wheeler, I believe, is away on his vacation. It might be interesting to note that the arrangement of Harvard postgraduate work in entomology is to have the session last through the summer,

and the vacation in the winter. Professor Kellogg wrote that he could not be present, but at that time said he could send some remarks, but I have not received them. Dr. Forbes wrote that he might be here.

PRESIDENT SANDERSON: I am very much interested in this discussion, but it struck me that the papers were all dealing in the preparation of the entomologist. Now, I think most of us have to deal with the preparation of the farmer and the fruit grower generally, and there are only a few of us who have the privilege of training up entomologists. I take it that the teaching of entomology is just as important for the masses, as it is to train up the few who are going to be the workers, and I wish we might have discussion on that phase of the subject. For instance, how are we going to teach these men, like Professor Osborn has mentioned, these two-year men, the kind of men we find in the School of Agriculture? We are getting an increasing number of this class of men. What sort of work is given in entomology? How do you get them, for instance, familiar with the plum curculio, and the various other forms of injurious insects? Do you merely tell them about them, and show them a lantern slide? Do you discuss a family of insects, and have a case of specimens, which you put on your table and invite your students to look at? Now these are some of the things that have occurred to me. How do you do field work in the winter—your school classes begin the first of October, and you get out the first of June? Should entomology be required in all agricultural courses? Many would say "yes," many "no," and yet how many say they took the course, not because they did not know much about it, but because it was a snap, for they got the same pedagogical value from it as from some other course? Then, another thing, is the systematic work; is it of any real value to a man, and is it taught in such a way that it will be of value to him? If any of you want any suggestions along this line, if you ever get a chance, talk to Professor Lochhead of Canada. His idea of entomology is of teaching it just hind side to; of starting by giving the students the economic phases, and then taking them out into the orchard and saying, "Is this insect beneficial or injurious; how are you going to tell?" It then occurs to them that systematic entomology has some application. I have tried to interest a class of students who have no idea of going into entomology. How can one give those men a training that will be of any practical value to them? I believe if we went so far as to make elective economic entomology, it might not be a mistake.

MR. J. B. SMITH: We have a short course at our institution, and it is really a short course, only lasts thirteen weeks, and I give a series

of lectures. An assistant does work with the students one hour in the morning, and four afternoon hours in the divided classes, so that every student gets a little information early in the period. Every one of the questions the president has asked has come to me, and at the same time I do not make the slightest effort to teach systematic entomology, beyond the teaching of orders; but what I do undertake is to teach how to tell the difference between an injurious insect and one that is not injurious, or between one that can do a certain kind of damage, and one that can do another kind. And then, in regard to another matter that was brought up, and that is, how do the men recognize these insects. I make it a point to have collected during each season, as many of the common injurious insects as it is possible to get hold of. Of course, we cannot get all the injurious insects, but we can secure plenty of plum curculio, plenty of bark borers, and plenty of the work of these insects, even if it is necessary to bring in the trunk of a whole tree that they may see the actual work, and they are expected to do some practical work. I think we can do a good deal of teaching, even in a short time, in this way.

MR. ROGERS: The question of using charts and lantern slides to present beautiful pictures may not be the best way of teaching. I know a teacher who, in his books, has some very fine diagramatic illustrations, and prior to the time we would go into the room we were expected to draw these exactly. Now it struck me that was not the best way of presenting a subject. Personally I am poor at drawing, but I would rather draw one part, and extend that to another until finally I had made the whole diagram, as requiring less effort than some other form of study, but it would be good training if the student applied it in entomology. Now, there was another point brought out, and about which I talked with Mr. Headlee here, and that is, teaching a certain subject back end to. I found that I had a little more work than I could handle, and in teaching physiology it occurred to me that I was not teaching anatomy just right, that instead of going over all the bones of the body, then finally the muscles uniting them, and so the whole frame, I would take just the trunk, and then the ligaments and then the bones. The main object I had in view, was that the student had to obtain certain ideas when he was in school. I never supposed when I was gathering Vermes and Arthropoda that it would ever be up to me to teach the subject, so I thought it was better to proceed in zoölogy with a definite study of one species, and learn that thoroughly. I note that some of the discussions here suggest preceding the study of entomology by zoölogy.

MR. GOSSARD: I should like very much to hear from Professors Washburn and Summers on this subject.

MR. SUMMERS: I am not so modest as Professor Washburn, so will talk before he does. I am out of the teaching of entomology, almost, to my great regret, and I can only say a word or two about one or two special problems at this moment. One special problem that I have at present is to arrange a very brief course required in entomology for certain agricultural students who have had insufficient preparation in general zoölogy, a course that is not at all worthy of a place in any institution, that is, one fit for the college student; the short course student takes but a thirteen weeks' course. Now, what we will do in the case of the student who comes to us with no preparation in general zoölogy, and to whom we are to give instruction for a single semester in entomology, is really my great problem. I have a strong feeling in connection with our courses in entomology, that we ought either to demand sufficient time to give a respectable course to students who take up that work, or that we ought to refuse to teach it at all; and I have done so the present year. Within three hours of taking the train to come to this meeting—I refused to teach a course in my department that was to have only partial time for one semester, in which I was expected to give training to forestry students in forest entomology—no general zoölogy, no general entomology. I think the reasons for that hardly need explaining.

MR. WASHBURN: I think Professor Summers hit the nail on the head when he refused to give instruction on such meager general knowledge. Now, Mr. Chairman, I approach this subject from a different point of view from that taken by any one else, and I think Mr. Gossard may be a little disappointed in what I have to say. From the nature of my position, my ambition is to do the very best economic work possible, and to do that, we need in Minnesota, as we all need, trained men. We have great difficulty in finding men of experience to take positions of responsibility in this line. What is the reason? I can only answer for my own institution. I do not think the Board of Regents appreciates the importance of entomology, practical entomology, or any entomology. I do not know whether that is the case in other institutions, but that is our difficulty, and I should like to see more entomology put in, and I want to get a chance at the boys when they first come into the college, so that they may learn for themselves whether they like entomology or not. Now, I have drawn a resolution, Mr. Chairman, which it will do no harm, I am sure, to present at this time. It might be helpful to some of us, and certainly could not harm us, though Dr. Smith and Professor Summers might not agree with me.

PRESIDENT SANDERSON: There would be no objection to the

presentation of the resolution at this time. It might be read at this time and considered tomorrow.

MR. WASHBURN: In view of the increasing demand for trained entomologists, and the lack of properly qualified men to fill these positions, it is hereby resolved by the Entomological Society of America, and the American Association of Economic Entomologists, in joint meeting, that boards of regents in universities and agricultural colleges be urged to give all possible teaching in this practical subject, both in undergraduate and graduate work.

MR. J. B. SMITH: I have no objection to this.

PRESIDENT SANDERSON: It might not be a bad idea to refer this matter to the committee on resolutions, Messrs. Headlee, Sanders and Symons.

MR. SYMONS: Mr. Chairman, as we will not have a chance to take this matter up again, I should like to say a few words in regard to the future outlook. Certainly if the work is left undone, as suggested by Dr. Smith and Professor Summers, and you get out of it by not giving the proper courses, I think you will find that other departments in the institution will take up the time you have had for teaching. In other words, if you do not push the work, and demand a certain time for it, is there not going to come a time when there will be very little teaching of entomology in your agricultural colleges and universities. I might say I have had some very hard work in Maryland. We had a very limited course, and I maintained that the course was not sufficient, and felt justified in endeavoring to increase it; and during the last two or three years we have increased our courses from, I believe, about four to twenty, and the only regret I have is that I cannot impress upon the president the fact that he should appropriate more money for doing this work.

MR. J. B. SMITH: You have increased from four to twenty what?

MR. SYMONS: Courses in entomology. We have two-week, ten-week, two-year in horticulture and agriculture, and regular four-year students, and in this regard I would say we have time to get the boys when they first come to college, and introduce the work into the preparatory courses. I have recently revised the curriculum and raised the standard, and in doing that was able to get in more time for entomology and zoölogy. When I said twenty courses, I referred to both entomology and zoölogy. We have had excellent results with the "preps" and freshmen in taking practical work, and it certainly seems very desirable to give them practical work in elementary courses that will establish their interest in zoölogical work; but as I say, I am confronted with the question of securing sufficient money to carry on these courses properly without making it embarrassing to

my state fund. Another question arises in regard to the amount of instruction given in the public schools of our states. How many public schools of this country are teaching entomology? I firmly believe all of them should be teaching it in an elementary way. It could be taught much easier than many other subjects, it seems to me.

MR. S. J. HUNTER: I have been very much interested in the discussion this afternoon, because it has presented a phase of the subject that I am not familiar with from experience, because in Kansas we have no short courses. I take it for granted that it was intended that each should say something about his own institution in regard to the work done. I think every one of us has been impressed with the students' change of attitude toward the institution from the day he begins, when the thing is "a bug," and the day he leaves with a proper view of life. At the University of Kansas we require zoölogy for entrance. Entomology we do not absolutely require, but we see that the student takes it before passing out of the course. We endeavor to make entomology a two-year course, taking the man in the sophomore year; the first year, three days a week is given to two hours' laboratory work, two days a week to systematic study through the year, at the close of which we expect the student to be familiar with all the common forms as far as the family. The next year he gets more of the same, but we have no special work students until the graduate year. We insist upon the first year's work being as intensive as possible. Of course, we recognize the fact that many of our students do not go on with entomology.

MR. SWENK: Regarding the instruction in entomology, and the advisability of such a course in a secondary school: in Nebraska we have three courses, the summer school,—the School of Agriculture offers four years,—and a six weeks' course in the winter, known as the winter course. Now, as an answer to the question as to whether entomology has a place as a required subject, I would say that the competition for a place as a required course in the four-year course is quite keen at our institution, and the law of the "survival of the fittest" has not ceased to operate. In this course if we were not giving practical instruction it would, in all likelibood, be dropped, because the subject is not a prime favorite. Now, the method of teaching, as employed at this institution, is, as Professor Bruner says, one that simply evolved during the past eight or nine years. It has been changed in different points from year to year, especially during the latter years, and as we are presenting it at the present time it seems to give some measure of success. Still, we find the work must be made exceedingly elementary. These boys come to the school, many of them, very green, and with very insufficient preparation,

and what they want is the most practical instruction. About 90% of the boys return to the farm at once, and of the 10% which continue, the most of these go on in the College of Agriculture and specialize in various lines, fitting themselves for experiment stations and other positions, and so the problem concerning us is to implant in the men something that will be of value to them. We start in the four-year course with the men, which is the most important of the three, by trying to give every student a good foundation. We give them some idea of the transformations of insects, and something of biology, and something of classification, but we do not give this instruction in the terms I would use to you. We make it perfectly simple, and illustrate it as far as possible. We make much use of demonstration materials in the class room, and that, up to this time, has taken the place of laboratory work. We then take up the study of orders. We do not use technical names any more than necessary. Our object is to give a general idea of the different types of insects, and something of the relationship of the different forms, something of the life history. This takes up the winter semester, and is considered the ground work. At the end of this the work changes radically, we turn about and face the practical side of the problem as intensively as possible. We take up in succession the particular crop pests of our own section, beginning with the chinch bug, the Hessian fly, wire worms, corn worms, etc., taking these in turn and giving an idea of the appearance of the insect, so that the student can see the importance of the study. In these demonstrations some Riker mounts are employed, and others we have prepared, exhibiting the life history, cases showing the work and the insect in its varied stages. These are placed on exhibition, and sometimes we dismiss the class, so that each student can view the insects and their work. The student then gets a good idea of the pest. We then deal with the life history, but only so far as the life history involves methods of control. We try to show the student why we apply certain methods of control, and try to give the most practical information we can impart. The work with the women, perhaps, is not so pertinent here, but the first semester is practically the same; the second is devoted to household insects and human health. In the case of the short course, the subject is presented in an even less technical way—demonstration material and lantern slides—we do not decry the use of lantern slides. This is another way of placing before the students a concrete idea of the work in hand. As to the practical results of these methods I will say that many students, when they return to the farm, write in concerning certain pests, and the intelligence displayed in the questions asked indicates that the man has been a student in our institution, without

our having to refer back to our records. We are now about to undertake a rather important step. The work has been given in the freshman year, and we have found that while we have had some success, yet we feel we can do much better if we advance the work two years, giving it in the third year. So the work from now on will be given in the third year, and we are attempting to give some laboratory work with it, and that is exceedingly difficult to work out.

MR. SANDERS: I believe one of our greatest difficulties in teaching entomology is that we work from cause to effect, rather than from effect to cause. I have found in my work in Wisconsin that I can get the interest of fruit growers very much better by addressing them on the work of apple insects, and from that to the life history stage by stage, working from the injury to the insect. I have applied that method in my teaching to a large extent, and have taken the work from effect to cause. Another thing I thoroughly believe in is to divide and subdivide classes into small groups of six or eight, and to talk to them in a conversational tone, using lantern slides, if necessary. I believe personal contact with your men is far better than attempting to teach a large number in a lecture.

PROFESSOR SUMMERS: I move we adjourn. Seconded. Carried.

Morning session, Thursday, December 29, 1910

Meeting called to order at 10.30 A. M., in Entomology Lecture Room, Main Building, Department of Agriculture, St. Anthony Park, Minn., by President Sanderson.

PRESIDENT SANDERSON: The first thing on the program for this morning is the discussion of the presidential address. I will call Professor Summers to the chair again.

MR. SUMMERS (in the chair): Gentlemen, our presidential address is open for discussion. As I remember it,—it is such a long time since it was delivered,—he said something about preceding presidential addresses being deeper and of greater import. I think all of us here, without exception, will make an amendment to that, and strike out the reference to past addresses. The discussion is open.

MR. OSBORN: It is pretty hard to say which of the many strong points in the president's address impressed me most. There were a number of points which impressed me at the time, but several things have come up since to drive them out of my mind; but one, the matter of coöperation, it seems to me, is a very sensible idea. Now, as stated in that address, a number of years ago a committee attempted

to do something in that line. We then experienced difficulty in securing coöperation, and while the situation is perhaps somewhat better now, still there is a good deal of it with the work in each station, and the work in each state will be determined by that of the station. Some work does not permit of coöperation, though I think the general idea is practicable.

PROFESSOR WASHBURN: I think perhaps the thought may have occurred to some of us that the method suggested by Professor Sanderson might possibly make one less original. In other words, there would be a tendency to fall into the ways of others, and we would be very apt to adopt their ways and methods instead of originating something ourselves. It is undoubtedly a mighty good thing to know what other men are working on, but just how far we should go as to the interchange of methods I do not know. It seems to me each man must determine that for himself. It would appear that the Office of Experiment Stations has some pretty good reason for not giving out what their Adams Fund men are working on. I should be very glad to find some man who is working along the same line I am, though I should not like to see a system established by which we were obliged, or even advised to give out every bit of work before publication. That is purely a personal view.

MR. J. B. SMITH: This matter has been brought to my attention several times,—the idea of somebody else working along the same lines that I, myself, was working. I have no fear that it would hinder originality in any sense, but my experience has been that I should like to have my own results and conclusions checked up by somebody who was working along the same line under somewhat different conditions. I have frequently got bulletins in which an allusion was made to certain work, and upon reading them over I decided, "Well, now, that may be all right where that work was done, but it does not apply here." The insects that are counted of so much importance in that bulletin as to require treatment, are practically of no importance in our state, and it would be a waste of time and money if we were to treat them in the same way. I have sometimes felt that possibly I was doing work which I considered important and far reaching that, after all, might be only of local interest, and if I had some way of knowing what others were doing along that line, it would be of considerable help. Of course, the man who originates a new line of investigation who takes up a path that is a little different from that of others, likes to be credited with taking up that line of investigation, and I do not see why that is not possible. Suppose we find two or three men who are working on the plum curculio, to take a common insect. Now I might think a certain point had not

been sufficiently studied, or there was a new way of studying the problem, or the method of dealing with it. I might suggest that, with the understanding that whatever experiments were made along that line should be credited to me as making the suggestion. Let the man who does the work get all the credit for the work, but let him give due credit to the man who made the suggestion, and then if you publish in two or three states at approximately the same time it will be possible to tell just what importance is to be attributed to the suggestion, and the results will, of course, be of infinitely more value than if the line of work were carried on by one individual only. I think we ought not to go away without taking some steps toward putting the president's recommendation into a tangible shape.

MR. LOWE: President Sanderson's address has been most inspiring to me, as I shall go back to my work with the possibility of not meeting another entomologist for a year, as I have done the past year. Touching the point which Professor Osborn raised, of coöperation, I think it is very desirable, but one that we would find difficult in our work. We are developing methods along a new line of work that we could not give out to many men to work on. We want accuracy of results, and in that respect I might refer to Mr. Washburn's remarks about the interchange between entomologists at work upon one line of investigation, and Dr. Headlee's paper on projects; all of which I feel are going to help me a good deal in my work. I thank President Sanderson particularly for his address.

MR. GOSSARD: In talking with members upon this subject I am impressed with the idea that the great difficulty we have is in finding some workable plan by which we can know what others are doing. I do not believe it would interfere at all with the work, and so far as duplication is concerned, we might profit by it. Personally, it has seemed to me that duplication in publication upon some of the great problems of entomology was exceedingly desirable. We called attention to the point, when Dr. Headlee wrote us that we really had no satisfactory method for controlling the codling moth until it has been worked over by a number of men. We have to work those things out, each one in his own state. There are from one to a dozen other great entomological problems in which we would make great progress, and in which we would do more for the public good if we had some sort of team work. It has seemed to us that our great difficulty in advancing scientific entomology is this. We have a somewhat similar condition in what used to be known as "Agriculture." It was pretty generally agreed that it was a study which was sort of divided off into different departments, each having its work. It became scientific agriculture as the different departments worked

together, and it appears to me that except for the systematic part of it, economic entomology is very much in that condition. We recognize this in a way, and yet there is no classification, and a young worker cannot tell just who among the entomologists are interested in those things in which he is especially interested. Now, if we knew those entomologists who had taken chemistry, those who had taken pathology, and those who had taken horticulture or mechanics, and we had a method of classification,—it would have to be rough in the first place,—but it would enable any student to consult with the few who were interested in those themes in which he was interested, and would create a sort of division of economic entomology, in which there would be chemical economic entomology, the mechanical economic entomology, the horticultural, the pathological, etc., and it seems to me we could coöperate in that way better than we could by having a committee, and know, at least, just exactly what we were doing. I should feel considerable trepidation if I should undertake to tell some of the veterans what they ought to be doing, and I am quite certain that no committee would feel like fixing the lines as to what any man should be or should not be doing. It would be useful to have some such statement as Professor Headlee proposes each year, to see who is working on each problem.

MR. WASHBURN: We have no time for a debate, but at the same time I do not want to be misunderstood. I believe thoroughly in coöperation. I believe in knowing what each one is doing, it would forward the cause, but at the same time human nature is very much the same, and I think if some one, who perhaps is a little more original than others, should pursue certain methods in investigating the codling moth, for instance, we might, at least some of us, follow the same methods, because it is so easy to follow, and yet those methods might not be so good for our state as something we had thought of ourselves. At the same time, that does not oppose coöperation.

MR. R. L. WEBSTER: It seems to me the general idea of coöperation is a very good one to most of us. As it is, we have, in a way, divided the work, giving one man a problem in one state, and another man another. We really do not know much about an insect until we have seen it two or three years, and studied its life history, and our work must be largely independent. I believe as Professor Gossard says, we could get a great deal out of coöperation, but we must get in and dig. Regarding originality, I think it always shows itself in publications; there is always the stamp of it in entomological bulletins or articles. By looking them over you can see whether the author has really got in and worked out the facts, or if he has simply bor-

rowed from other publications. I would like to do some work in coöperation with other men.

MR. SYMONS: I wish to express my appreciation of the president's address, and I wonder if it would be out of the way to suggest the appointment of a standing committee to carry out this idea, mentioned by Dr. Headlee, to start a system of uniform methods, which we could all agree to, as treatment against various pests. We have a standing committee which has done most excellent work in the suggestion of common names, and I wonder if we could not make a start on a uniform method in the treatment of some of our insect pests. For instance, it would not be out of the way for this Association to indorse the lime-sulphur treatment for San José scale. Anything that will tend to strengthen our position, it seems to me, will be advantageous. As was pointed out by President Sanderson in regard to the chemists, their methods are accepted by practically all official chemists, and it may be that we could make a start.

MR. HUNTER: I think that the president's address was one that looked far into the future. It deals with the problem that is before us, not only in our own line, but practically all lines. The question is whether the greatest advance in science is to be through coöperation or competition. It seems to me the important thing is the advancement of science rather than of any personal matter. Now, I think that one speaker spoke very well when he said there was a great difficulty in formulating plans. I think we all agree that plans, however thoroughly recognized, are of little avail unless the true spirit is evident. We have taken up the matter of coöperation in our own institution, in the past few years in larger degree than ever before, and, speaking personally, I must say that it has not seemed a curb to individuality or originality, but rather to stimulate it. For instance, in one problem our department had under way, about completed now, the problem was turned over to our department and the department of bacteriology; another one was turned over to our department and that of biology, dealing with the external and internal features, and there are a number of problems in our state being worked out by our institution, and all through the departments working together. It has been to me a personal stimulus to better and more thorough work, and I am going away from this meeting with a deepened impression of the unanimity of spirit manifest here.

MR. HEADLEE: It has surely seemed to me that one of the greatest results that can come from the work of such a committee is the inspiration that such a committee may give as the result of broad-gauged discussion of the projects. It should get out a report which should stand, in respect to this work, much as the Carnegie reports stand in

respect to education—something that looks toward the future, something that holds up an ideal, something that influences men by directing them. This committee cannot command, and say you shall do this and the other thing. It can merely stand as an inspiration to us, and that is the kind of work I should like to see this committee do. It is the kind that would help me, and not for one moment do I believe that acquaintance with plans under consideration will reduce originality. It will form a basis of effort. One man will find out what another man is interested in, and he will look at that plan, and if it appears good to him he will adopt it. We are after the advancement of our science, rather than the advancement of the individual. There may be a minority of men in the country at large, I believe, who are firmly of the opinion that if their plans become known, they are so good and so desirable, that those of us that can will take up their ideas and work them out before they have finished. Now, the reason one party gave me for the office of experiment stations not divulging the plans of other entomologists was along this line. The office had refused to tell him the plans because certain entomologists were afraid their plans would be taken up and worked out by somebody else before their work was finished.

PRESIDENT SANDERSON: If it is in order, I should like to make a remark. I appreciate very much the cordial expressions in regard to coöperation, and I might say in explanation that the idea of coöperation I intended to convey was that it was to be purely voluntary. My main idea was that we could further this work through greater publicity, and Dr. Headlee has expressed the idea very clearly. There is one other point—with all due deference to originality, and I think I do not want to do anything which would retard originality, I feel that we have sometimes suffered from over-originality. If all the chemists were working by individual methods, we would have a very sad state of affairs. Now take in entomology, as a matter of comparison, the results of the codling moth work, which we have alluded to previously. I would not say we must all work alike, but at least try to get together. And then, this matter of team work, which Professor Headlee has spoken of, I think any of you who have had anything to do with station work, will appreciate that fact. Team work is the coming thing. Some of the biggest men in the Department of Agriculture have done their best in team work, and yet we have men in every station who do not want to pull with the other fellow because they are afraid he will get ahead of them. We do not want to frustrate originality, but men must be brought to realize the importance of working together. If we have to put a horticulturist, a botanist, a chemist and an entomologist on a problem all together for the proper

working out of the problem, it must be done. What Dr. Headlee said in regard to some men holding up ideals along that line, and especially policies looking toward the future, was exactly what I had in mind.

(To be continued)

PROCEEDINGS OF THE NINTH ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF OFFICIAL HORTICULTURAL INSPECTORS

The Ninth Annual Meeting of the American Association of Official Horticultural Inspectors was held at Minneapolis, Minn., December 29–30, 1910.

For convenience, the business transacted at the meeting will be reported first, which will be followed by the papers and discussions.

PART I

The first session was held in the parlors of the Hotel Dykman. The meeting was called to order at 8 p. m., by President F. L. Washburn, with T. B. Symons as secretary. Among the inspectors present during the meeting were:

F. L. Washburn, St. Anthony Park, Minn.; J. B. Smith, New Brunswick, N. J.; H. E. Summers, Ames, Iowa; G. G. Atwood, Albany, N. Y.; N. E. Shaw, Columbus, Ohio; E. B. Engle, Harrisburgh, Pa.; E. A. Back, Blacksburg, Va.; T. J. Headlee, Manhattan, Kans.; S. J. Hunter, Lawrence, Kans.; C. E. Sanborn, Stillwater, Okla.; C. B. Waldron, Agricultural College, North Dakota; Lawrence Bruner, Lincoln, Neb.; J. G. Sanders, Madison, Wis.; T. D. Urbahns, Fort Collins, Col.; H. C. Brookins, Brookings, S. D.; F. T. Wiley, Urbana, Ill.; and T. B. Symons, College Park, Md.

The visitors present were:

A. F. Burgess, Melrose Highlands, Mass.; L. O. Howard, Washington, D. C.; E. D. Sanderson, Morgantown, W. Va.; M. H. Swenk, Lincoln, Neb.; G. D. Shafer, Agricultural College, Michigan; and H. A. Gossard, Columbus, Ohio.

Mr. G. G. Atwood, chairman, submitted the report of the committee on permanent organization. The following constitution and by-laws were adopted and a permanent organization formed:

CONSTITUTION

Article I

Name. This organization shall be known as the American Association of Official Horticultural Inspectors.

Article II

Object. The object of this Association is to promote Agriculture and Horticulture in the country at large by devising and securing the adoption and thorough enforcement of such laws as will secure to the grower stock as free as possible from insect enemies and plant diseases.

Further, it shall be the object of this Association to obtain more uniform standards of inspection in the various states.

Article III

Membership. The membership shall consist of active and associate members.

Article IV

Officers. The officers shall consist of a President, Vice-President, Secretary-Treasurer and Executive Committee.

Article V

Meetings. The regular meetings shall be held annually at such time and place as shall be designated by the Executive Committee.

Quorum. Seven members including President and Secretary, or their representatives, shall constitute a quorum.

Article VI

Amendments. The constitution can be amended by a majority of votes of all active members.

BY-LAWS

Article I

Active Members. Active members of this Association shall consist of the person or persons of each state, country or United States Department of Agriculture, under whose authority certificates of inspection are issued or their authorized representatives.

Associate Members. Associate Members shall consist of assistants and co-workers in official service.

Article II

President and Vice-President. The President and Vice-President shall be elected by ballot at each annual meeting and neither shall succeed himself. The President shall deliver an annual address on a subject relative to the interests of the Association.

Secretary-Treasurer. The Secretary-Treasurer shall be elected by ballot at a regular annual meeting for a term of three years and shall make reports of the proceedings of all meetings, and submit the same to the Executive Committee for publication. He shall submit an annual report of receipts and disbursements.

Executive Committee. The Executive Committee shall be composed of the officers and three active members, to be elected by ballot at the time and place of annual meetings; provide for publications of proceedings; examine the books of the Secretary-Treasurer and recommend candidates for membership.

Article III

Dues. The dues of active members shall be $2.00 per annum, and for associate members, $1.00 per annum.

Article IV

Nominating Committee. The Nominating Committee shall be chosen by the Chair at the opening session of the annual meeting, which committee shall nominate officers for the following year.

Article V

Limitations. Only active members of the Association *or their properly accredited representatives* shall be permitted to vote for the amendments of the constitution or by-laws or for the election of officers.

Article VI

Amendments. These by-laws can be amended at any regular meeting by a two-thirds vote of the active members present.

Mr. T. B. Symons, chairman, submitted the report of the committee on affiliation. The report was received and the committee continued.

The secretary read a communication from Dr. T. J. Headlee, secretary of the meeting of inspectors from four states that met at Fort Smith, Ark., December 15, 1910, submitting a memoranda of the action taken by these inspectors at this meeting.

The following resolution offered by Dr. J. B. Smith was carried:

Moved: That the secretary be instructed to advise the secretary of the meeting at Fort Smith, Ark., of the cordial concurrence of this Association in the views and objects expressed in their communication. That he forward to such secretary a copy of the constitution and by-laws just adopted and invite the membership of the states represented at that meeting in our association.

By motion the president was authorized to appoint a committee on nominations and resolutions. The chair appointed Messrs. J. B. Smith, H. E. Summers and T. B. Symons to serve on both committees.

Further business was taken up at the last session as follows:

T. B. Symons, chairman of the committee on national legislation, made a report of progress and suggested that the Association endorse the Simmons Bill, providing for national inspection of imported plants, etc., before Congress. Dr. L. O. Howard explained the present status of the bill, and Dr. J. B. Smith read extracts from an excellent paper by Dr. Marlatt on "History of Such Legislation."

By motion the report was received and committee continued, and authorized to expend such funds as necessary, not to exceed $25 in promoting such legislation. The members of this committee are T. B. Symons, E. L. Worsham, and G. G. Atwood.

Report of Nominating Committee

The committee submitted the following report, which was read by President Washburn:

President, Franklin Sherman, Jr., Raleigh, N. C.; Vice-President, T. J. Headlee, Manhattan, Kan.; Secretary-Treasurer, T. B. Symons, College Park, Md. Three members of executive committee, J. B. Smith, New Brunswick, N. J.; H. T. Fernald, Amherst, Mass.; and J. W. Jeffrey, Sacramento, Cal.

Signed

J. B. SMITH,
H. E. SUMMERS,
T. B. SYMONS,
Committee.

By motion the report was adopted.

The following resolutions were adopted:

Resolved, That this Association heartily endorses the Simmons Bill, now before Congress, in all its points, and urges upon its members the importance of advising the senators and representatives of the need of this legislation for the protection of the agricultural and horticultural interests of the country at large.

Resolved, That the thanks of the Association be expressed to the authorities of the University of Minnesota and of the Agricultural College for the courtesies extended to it during our meeting.

PART II

President F. L. Washburn made an address at the first session of the Association. [Withdrawn from publication.—ED.]

NEW YORK NURSERY INSPECTION

By G. G. ATWOOD, *Albany, N. Y.*

Inspection of nurseries for the purpose of certification was first provided for by act of legislature in 1898; $10,000 was appropriated. The Commissioner of Agriculture under the Agricultural Law was the enforcing officer, and he began the work with four inspectors. Two of them are still employed, and two have sought more congenial and profitable occupation.

The following five or six years of our work showed that the scale was continually turning up in the most startling manner and in the most unexpected places. More inspectors were put to work and the nursery centers were, throughout the year, kept under the surveillance of our inspectors. Notwithstanding thousands of nursery trees were sacrificed by rows and blocks, we had the hearty support of our nurserymen who united on the idea that nursery stock should not carry or breed scale. They stood the losses without state aid, and became so friendly that their constant demands for inspection placed no little burden on our men.

On Long Island, where the scale had become established in the highways and hedges, before our inspection law was enacted, the nurserymen have practically given up growing trees and plants on which the scale thrives. The custom of raising trees in nursery rows to bearing age in the eastern part of the state, and the methods of making "hospital" out of all good trees left over after packing in the western part of the state, were both abandoned. Thus a fertile source of continued infestation was eliminated.

We do not claim that all of our nurseries have always been free from scale one year or another, but we have a well-founded belief that they, at the present time, are practically free and under sufficient control so that practically no live scales are shipped. The records of the past year would not prove one per cent. of our shipments infested. Our nurserymen generally reject trees showing scale marks, though no live scales can be found upon the trees.

We have one nursery center in the state embracing nearly 1,000 acres of growing trees (over 20,000,000) where scale has never been found. The methods of this community and the care of the nurserymen are the principal reasons for the immunity. They rarely buy trees or buds from outside their Association's influence, and when their blocks mature they are sold from and the residue burned. Other nurserymen are mastering the problem by great care in making their purchases, in selecting their buds and scions and fumigating them. Our inspectors have been constantly giving attention to the surroundings of all nursery plantings in the state and, where necessary to protect the nursery, a thorough cleaning up or destruction of infested trees is insisted upon.

If infested trees are found in a nursery of growing stock between May and September they are at once dug and destroyed. If discovered early in the season several inspections are made and no certificate is issued unless we are positive that no infested trees are present on the date of the certificate.

All nursery stock growing within one half mile of a San José Scale infestation, whether on the nurserymen's premises or otherwise, must be fumigated. The fumigating houses or rooms are tested annually, the cubic feet computed and the material for the one-ounce formula given to the owners.

My story of nursery inspection in New York would not be complete without mentioning the very great results of that feature of our law requiring inspection at points of destination of all shipments into the state. This is so important that we wish to urgently recommend the adoption of the plan in other states. Under this division

of our inspection work we were fortunate in discovering and destroying over 7,000 nests of brown-tail moths coming in on nursery stock from abroad in the spring of 1909, and half as many more in 1910.

We also discovered on domestic shipments both brown-tail nests and gypsy moth eggs, and up to the present time believe that neither of these pests have become established in our state. This fall we found cast skins of gypsy moth on azaleas from Belgium.

By careful inspection of all shipments arriving we have found nursery stock that had to be rejected, otherwise it would have been mingled with our own and possibly have been shipped again under and to the disparagement of our certificate of inspection, a high character for which we wish to attain.

It has been the custom of our office for years to notify inspectors of other states, whenever we had reports of the receipt of infested stock —even when the number of trees was insignificant. Our reason for this is that by reporting our findings, and giving names of varieties infested, it would enable interested inspectors to trace back to possibly an unknown origin. Never have reports been sent to our brother inspectors with the intention or implication that in any way they were blamed or subject to criticism. Inspection for San José scale is not yet an exact science, and supervising inspectors live in glass houses. No restrictions of any kind are made, not even a requirement that shipments into the state must bear a certificate of inspection or fumigation, but the fact that all importations are subject to inspection at destination is becoming known, and the number of infested and diseased trees received is growing less and less. Nurserymen are more careful than formerly, and we all know that the inspection officers of the several states are improving their methods with better appropriations and experienced men.

976 certificates of inspection were issued in 1910.

463 to regular nurserymen.

44 to small fruit growers.

50 to vineyardists.

326 box inspections.

10 special stock.

83 special fumigation certificates.

There were also issued 407 duplicate certificates for shippers to file with the authorities of other states.

The total number of foreign and domestic shipments into the state in 1910 exceeds 6,500, about 1,000 more than in 1909 when there were 234 car loads, 12,149 boxes and 1,630 bales embracing over 4,000,000 trees and plants, and over 10,000,000 seedlings.

We learn of shipments into the state in various ways. The law

requires custom house brokers to register and to report shipments. Transportation companies also report required facts, and all persons bringing in stock are expected to report to the department. We keep a man at the New York City custom house to copy manifests. The collectors of customs in the state also advise us of importations, and Dr. Howard at Washington advises us of many lots.

Our inspectors are all under pressure during the shipping season, and during their travels they occasionally find a shipment not reported, but the number of such is not over 2% of the total.

There are about 121 custom house brokers in New York and nearly 30 transportation companies reporting to us.

We have 15 inspectors and 10 assistants who are employed throughout the year. Nursery inspection work has broadened considerably and our activities increase.

The nurseries embrace 11,000 acres and contain 110,000,000 trees and plants of which 33,000 plants have been burned because of scale. When the nurseries are cared for, some attention is given to inspection of orchards.

2,500 orchards containing one and one-quarter millions of trees were inspected in 1909.

35,000 trees were ordered sprayed for scale.

12,500 trees were destroyed because of peach diseases.

1,250 trees were cut for black knot.

We have 60 square miles in a peach belt where we cut 4.5% of the trees in 1904. We are working on the theory that by constantly cutting out Yellows and little peach diseases each year, that they can be controlled with slight loss. It would seem that the plan gives strong evidence of success, for in last year's inspection about .9 of 1% had to be destroyed.

Another field of our work for the past two years has been the inspection of several hundred thousands of white pine seedlings planted in the state for reforesting.

In the spring of 1909 it was found that the Forest, Fish and Game Commission, and some private parties, had imported from northern Germany a large number of white pine seedlings, among which the blister rust was found generally distributed. Full information on this subject was given in a bulletin.

This last summer it was deemed necessary to reinspect all the plantings and destroy all infected trees, and also search for and burn all plants of the Ribes within, and adjoining, the plantations.

The alarm caused by our discovery of brown-tail and gypsy moths coming in on nursery stock and on evergreens to be used for decorations, awakened all the efforts of our inspection force. Our commis-

sioner has determined that neither of these pests shall become established in the state during his administration, and we have exhausted every precaution that seems feasible. We have for years kept watch of the highways and rail tracks leading into New York from the moth infested areas of New England, but in order to be informed on the best method of scouting, we asked for and secured from the Massachusetts authorities two of their best men who spent a month each in the state accompanied by several of our own inspectors. Seven of our own inspectors were sent for a few days to Massachusetts. By the courtesy of Mr. D. M. Rogers, Special Field Agent, of the United States Department of Agriculture and under the guidance of Mr. L. H. Worthley, Assistant State Forester in charge of Moth Work in Massachusetts, they were permitted to study in the field of operations the whole subject of moth control. We also sent two of our young active and clear-sighted men to work a month in Massachusetts during the moth season to acquire information. All of these actions were taken to prepare us for the contest which sooner or later may come upon us. We want to prevent the fight as long as possible, and at the same time be prepared for the inevitable.

Our inspectors are also called upon to collect official samples of insecticides and fungicides sold upon the markets of the state under a section of the law, which provides also for certificates under certain conditions issued to manufacturers and dealers. Two hundred and fifty-one of these certificates were issued in 1910.

We also have the enforcement of the law relative to apple packing and the use of barrels of standard size for the sale of apples, pears and quinces.

PRESIDENT WASHBURN: We shall be very glad to hear discussions upon this paper.

MR. WALDRON: I should like to ask how many points of destination you have. You speak of inspection at points of destination; does that apply to foreign stock entirely?

MR. ATWOOD: We have hundreds of points of destination—wherever boxes are opened at the nurserymen's grounds or where plantings are made.

MR. WALDRON: In our state, for instance, where a great many shipments consisting of but a dozen apple trees, or a half a dozen cherries, and a few rose bushes, shipped from somewhere down in Iowa into North Dakota away up from the state line, it would be impracticable to inspect such boxes, and almost impossible.

MR. ATWOOD: We do not have to go as far in New York, but we spend a good deal of time chasing up these shipments.

MR. WALDRON: These shipments come from nurseries that bear certificates of inspection in Iowa, Minnesota and other states, and their inspection ought to be as thorough as ours. It would be an endless task, almost, to inspect all those shipments.

MR. ATWOOD: I thought it might be a good plan to have a point of entry where inspection could be made, but I doubt whether it would be possible to get authority to do it. The movement of nursery stock in interstate business, contemplates the delivery of that stock at the point of final destination, and there is no power that can stop or open an interstate package in transit. If any state wants to ship stock into New York, it can do so. The stock must be certified, when it gets into the state, then the state has control of it.

MR. SANDERSON: I would like to ask if there is any systematizing of that inspection. As soon as you get notice of the arrival of a shipment at destination, do you immediately send a man to inspect, or do you hold it there until you have several shipments that can be taken care of on one trip? Also, what is the approximate cost of such inspection.

MR. ATWOOD: We have several men distributed over the state, and two or three men at large nursery centers, such as Rochester, Geneva, Dansville, and down the river. Two or more men are available for these shipments, and the commissioner has authority under the law to order shipments held until an inspector is present, that enables us to look after things known to be suspicious. The expense of looking up shipments I could only give approximately. We have about thirty thousand dollars for our regular inspection work, and we have a special appropriation of fifty thousand dollars available this last year for an emergency, to provide against gypsy and brown-tail moths, or anything else, and I suppose the examination of six or seven thousand shipments would cost about ten thousand dollars.

MR. SANDERSON: Does that include the salaries of the men engaged in the examination?

MR. ATWOOD: Yes.

MR. SUMMERS: I was interested in one remark of the gentleman on my left regarding the small shipments, trivial almost in numbers of plants, which had already been inspected, and I want to say that I know of only two cases in which trees actually grown in Iowa have been found in other states to bear living scale. One of the two cases was an infestation of three trees which went into New York, and as I remember it, the whole shipment was only a hundred trees.

PRESIDENT WASHBURN: Mr. Summers, are you finding much San José scale?

MR. SUMMERS: We have a considerable amount of it in the southwestern part of the state. I think I reported five or six cases of it, but

it was under circumstances where it was completely eliminated, at least, it has not since appeared, but we have a good deal of it in orchards in the southwestern part of the state at the present time.

SECRETARY SYMONS: I consider the matter of inspecting shipments from other states very important, and one which I think every state should adopt. In the past two years I have made it a requirement, and wish it so understood by all nurserymen shipping stock into Maryland, that I intend inspecting the stock, and require from them a statement of all shipments. No matter how careful an inspector is, there will be some cases, on the part of unscupulous nurserymen, of unloading such stock, and I think that each state should have a law requiring all nurserymen to submit statements.

MR. SUMMERS: In states having little money, this may help in giving the impression among nurserymen that stock is very likely to be inspected. There is a case in the courts of Iowa that is interesting me: A nurseryman shipped in stock from another state, bearing the certificate of that state. The consignee refused to pay for it, partly, he said, because the stock was very poor in general character, but his defense in court has been that the stock did not bear a certificate which had been approved by the state entomologist of Iowa, as the Iowa law required. I should say that three-fourths of the nurserymen doing business in Iowa do not file in Iowa copies of their certificates, as required by law, and I have no means at present of enforcing that requirement; nevertheless, that requirement is printed by other states on their notices, and from some states I think I have received duplicates from nearly all the nurserymen. At present the only advantage is that it gives aid in court, the decision of the present case, which is in the circuit court at Sioux City, will show how valuable that is.

EDITOR'S NOTE.—Contributors doubtless appreciate in some measure at least, that exigencies of the makeup must determine to a certain extent the matter included in each number. An unusually large amount of copy was received from the secretaries of the Association of Economic Entomologists and also the Horticultural Inspectors. Practical consideration, not to mention the fact that this serial is the official organ of the first named organization, has rendered it advisable to include in this number more than the customary amount of matter. This has necessitated the holding of some papers already in type for a later issue. The editor would in self-justification call attention to the fact that he gave for all of this only a conditional promise of publication in February. We would emphasize once more the desirability of sending in brief observations which may be published in a separate department as scientific notes or used here and there as fillers. The editor should not be expected to supply all such matter.

PRESIDENT WASHBURN: The next paper will be on "European Conditions in 1910 and General Inspection Prospects," by Dr. L. O. Howard of Washington.

REMARKS ON INSPECTION AND SOME CONSIDERATION OF EUROPEAN CONDITIONS IN 1910

By L. O. HOWARD

(Author's Abstract)

The speaker described the establishment of an inspection service in Belgium, and gave the details concerning the recently established inspection service of nursery stock intended for foreign shipment in France, the details of which are given in the JOURNAL OF ECONOMIC ENTOMOLOGY for December, 1909, 3: 499–502. He also recounted his experiences in the nursery-growing regions of France in June, 1910, showing that in the very localities where the gypsy moth and the brown-tail moth had been unusually abundant in the summer of 1909, practically none were to be found at the corresponding period in the summer of 1910. No gypsy moths and no brown-tail moths were to be found in any of the great nursery-growing regions of Orleans, Angers and Ussy. This he stated is an encouraging condition of affairs for those who have to inspect imported stock in this country during the coming winter, but it by no means indicates that rigidity of inspection should be lessened.

The speaker gave an account of the hearings on the Simmons Bill held in the spring of 1910, and stated that the bill had been reintroduced, and that an effort will be made to secure its passage during the coming session. He indicated that the opposition of the Legislative Committee of the National Nurserymen's Association centered on section 8 of the Simmons Bill, which gives the Secretary of Agriculture power to quarantine against any section of a foreign country in which there has been shown to exist in dangerous quantity insects or plant diseases, new to the United States. He stated that in his opinion should the bill become a law without this section, it would be very much better than no quarantine or inspection bill at all, but that in the opinion of the phytopathologists, especially, the section in question, is one of great importance.

Other general features of the situation were referred to.

[Extracts were then read from the following paper, which in view of the great practical importance of the subject, is published in full.—ED.]

NEED OF NATIONAL CONTROL OF IMPORTED NURSERY STOCK[1]

By C. L. MARLATT, *Bu. Ent., U. S. Dept. Agric., Washington, D. C.*

The need of national quarantine legislation for the protection of the fruit and forest interests of this country from the accidental introduction of new and dangerous insect enemies or plant diseases on imported nursery stock or other living vegetable products has been long appreciated, and requires no argument.

The United States is practically the only one of the great nations of the world which is without legislation protecting it in this particular. The considerable lessening of yield and higher cost of production of many important staples, particularly fruits, is directly chargeable, in large measure, to the lack of such protective legislation in the past, as will be shown by a number of illustrations to be subsequently given. Furthermore, there is now an increased risk in this country over that normally existing by the introduction of foreign stock without inspection or other means of safeguarding, in that the protection which other countries have from proper legislation naturally results in this country being made the dumping ground for refuse and inferior stock. This state of affairs was brought out strongly by Dr. J. B. Smith, entomologist of the State of New Jersey, in his testimony before the House Committee on Agriculture at the last session of Congress. In his testimony Dr. Smith described the importation by large department stores of New York and Philadelphia of a mixture of inferior stock of fruit and ornamental plants massed down in large boxes, thousands of plants in a single case. This largely worthless, and often infested stock, is being distributed by these agencies either at a very low price or as gifts to customers, and goes in small parcels here and there where it cannot be followed, and necessarily entails the greatest risk of introduction of dangerous pests or plant diseases.

The regular importing nurserymen endeavor to get, and do normally get, good stock, which generally arrives in fair condition; but often such stock, as will be shown later, carries with it the gravest risk of introducing dangerous plant enemies.

The only important port of this country that has a plant quarantine service is San Francisco. There, for the last twenty years, a

[1]This paper is a reprint of one submitted to the House Committee on Agriculture, and published with the report of that committee, recommending the pending quarantine bill (Report No. 1858).

competent inspection of foreign nursery stock and fruits has been maintained by the state authorities. In a single year the quarantine officer of San Francisco destroyed over three thousand trees and plants infested with insects new to California, and much other stock has been thoroughly fumigated before it has been admitted. During these twenty years a great many dangerous importations of insects and diseases have been detected and stopped at the port of San Francisco, to the enormous gain of the fruit interests of California and, indirectly, of the whole country.

FOREIGN ORIGIN OF MANY OF OUR INSECT PESTS

Fully fifty per cent. of the important injurious insect pests in this country are of foreign origin. Among these are the codling moth, the Hessian fly, the asparagus beetles, the hop-plant louse, the cabbage worm, the wheat-plant louse, oyster-shell bark louse, pea weevil, the croton bug, the angoumois grain moth, and the horn fly of cattle, and, in comparatively recent years, such very important pests as the cotton boll weevil, the San José scale, and the gypsy and brown-tail moths. Many, if not all, of these pests, and others not mentioned, could have been kept out or their spread much checked if proper quarantine legislation had been available, and the saving to this country would have been enormous.

While it is true that certain classes of injurious insect pests, such as the house fly and other household insects, and other insects which may be similarly carried in ships' cargoes or in the packing of merchandise, have been imported, and still will be, in spite of any quarantine law, however rigid; it is equally true that the great mass of the foreign insect enemies of orchards and forests have come in on nursery and ornamental stock, and might have been kept out, in large measure, if an efficient quarantine law had been in operation.

Taking up a few of the insects just mentioned, the codling moth now costs, in loss and cost of treatment of trees, $16,000,000 annually; the San José scale, similarly in loss and cost of treatment of trees, $10,000,000 a year; the Hessian fly probably causes an annual loss of $50,000,000, and in some years this loss has reached the enormous total of $100,000,000. The loss chargeable to the boll weevil, from the very conservative estimate of Mr. W. D. Hunter, amounts to about $25,000,000 a year.

The gypsy moth and brown-tail moth in Massachusetts and portions of other New England States are now costing those states, in expenditures merely in efforts at control, not counting damage at all, upward of a million dollars a year. In addition to this, the National Government is appropriating $300,000 a year to aid in controlling

these pests along the highways, and by this means check their more rapid distribution. In spite of these efforts and this enormous expenditure, these insects are still slowly spreading, and great damage is done yearly to woodlands, private grounds, and orchards. The dissemination of these two pests over the whole United States, as is extremely likely under present conditions, would entail a like cost throughout the country—a tremendous and unnecessary charge on our fruit and forest interests.

Very careful estimates, based on crop reports and actual insect damage over a series of years, show that the loss due to insect pests of farm products, including fruits and live stock, now reaches the almost inconceivable total of $1,000,000,000 annually. The larger percentage of this loss is due to imported insect pests, and much of it undoubtedly would have been saved if this country had early enacted proper quarantine and inspection laws.

DANGER OF ADDITIONAL IMPORTATIONS OF PESTS NEW TO THE UNITED STATES

Great as is the number of foreign insect pests already imported and established in the United States, there remain many others with equal capacity for harm which fortunately have not yet reached our shores or crossed our borders or at most have infested only a limited part of our domain. The prominent examples of locally established pests, the general spread of which should be controlled to the utmost, are the gypsy and brown-tail moths.

Our increasing business relations with China and other Oriental countries adds enormously to the risk of the importation of new pests. We know very little of the injurious insect pests of those countries, and particularly of China, but the importation of new stock in the last year or two, from China especially, has demonstrated the existence there of many pests which have not hitherto been known. The power of harm of these new pests is abundantly illustrated by the San José scale which is one of the earliest of the Chinese insect pests to reach us, and undoubtedly came to this country with some ornamental nursery stock sent from north China.

Among the known foreign insect fruit pests which it is very desirable to keep out of this country are the Morellos fruit worm, which is an important enemy of citrus fruits in certain parts of Mexico; the olive fruit worm, which occurs throughout the Mediterranean countries where the olive is grown; the mango seed weevil, which has been found in imported mango seed during the present year; several fruit scale pests known to occur in China, Japan and other Oriental countries, which have records for harm quite as great as the San José

scale; the gypsy and brown-tail moths to regions in this country where they do not now occur; and many other equally dangerous insect enemies of fruit trees, forest trees and farm crops known to occur in foreign countries.[1]

In addition to the danger of importing these insect pests is the risk of bringing in new and dangerous plant diseases. Two illustrations of this danger only will be mentioned, but there are many others equally important. First may be noted a new disease of the potato, known as the "potato wart," which there is grave risk of establishing in this country. This disease, once in the soil, destroys the potato tuber, and prevents the culture of this staple. The disease was discovered in Hungary in 1886, and has since spread over portions of Europe and into England, where it is causing great alarm. It has also established itself in Newfoundland, and it is especially from this source that the danger to the United States comes. There is no known remedy for the disease, and its existence in the soil practically puts an end to potato culture. Its introduction into the United States would result in the loss of millions of dollars annually.

The other disease is the "white pine blister rust," which has caused enormous losses in Europe, particularly to nursery stock. This disease has, during the last year or two, been imported on nursery stock into a good many of our states and into the Province of Ontario, Canada. The greatest effort has been made to stamp it out at these points of introduction, and it is hoped that this work has been successful. If this disease becomes established in this country it will result in enormous losses in our pine forests.

Both of these diseases are examples of dangers which can be prevented only by an absolute quarantining of the infested foreign districts so far as importations therefrom to this country of these particular products are concerned. In other words, these diseases are often not discoverable by inspection, and can not be destroyed by fumigation. The pine disease may be present in the pine for two or three years before giving any visible demonstration. The potato-tuber disease may be in imported tubers and similarly escape detection.

HISTORY OF EFFORTS TO SECURE NATIONAL LEGISLATION

The need of legislation to protect this country from the ingress of foreign insect pests and plant diseases has long been felt, but nothing practical has been accomplished except the local quarantine established by the State of California.

[1]For a discussion of some of the more important of these, see article entitled "Danger of Importing Insect Pests," by L. O. Howard, in Yearbook of the Department of Agriculture for 1897.

The first general attempt to secure national legislation resulted from the introduction of the San José scale into the eastern United States and its general distribution on nursery stock.

A convention was held in Washington in 1897, composed of accredited delegates of horticultural societies, nurserymen's associations, state agricultural boards, grange alliances, agricultural colleges, and experiment stations, a large and representative body of men. After full discussion, a bill was drafted, which included both the inspection of foreign nursery stock and of home-grown stock subject to interstate shipment. While this measure received the endorsement of the convention and was submitted to Congress, it was not heartily pushed, and the different interests back of it were not fully agreed as to the desirability of all the features of the measure, and it was ultimately dropped, with the idea of replacing it by a more suitable bill.

No agreement was immediately reached, but in December, 1899, a bill[1] was introduced in the House by Mr. Wadsworth, of New York, very similar in purport to the draft of 1897. This bill was later (February, 1900) reported favorably from the Committee on Agriculture by Mr. Haugen, of Iowa, with the unanimous recommendation of the committee that it pass. In reporting this bill, Mr. Haugen gave a very clear statement of the conditions in the matter of imported nursery stock and also home-grown stock, and the arguments for the act, and stated in conclusion that "in the opinion of the committee this bill is a step in the right direction and worthy of early and favorable consideration."

Objections were made to this measure again, both by the nurserymen, who feared that it might put obstacles in the way of their foreign import business, and also on the part of certain state officials, who were fearful that the portion relating to inspection of home-grown stock would prove a duplication and unnecessary, and this measure also failed of passage.

The year following this same bill was introduced in the Senate without change, except date, by Senator Perkins, of California (S. 5615, 56th Cong., 2d sess., Jan. 17, 1901), but its passage was not pushed.

During the succeeding years, either by correspondence or by conferences, an effort was made, particularly by the state entomologists and state horticultural inspectors on the one side and the American Association of Nurserymen on the other, to draft a bill for recommendation to Congress which would be mutually satisfactory. Finally, in 1906, a joint legislative committee was arranged for, representing the Association of Official Horticultural Inspectors, the American Asso-

[1]Fifty-sixth Congress, first session, H. R. 96, December 4, 1899.

ciation of Nurserymen, and the Association of Economic Entomologists. This joint committee adopted a series of resolutions the following year, calling for national legislation very similar to that recommended by the original convention of 1897, namely, providing for inspection and regulation of foreign importations, and also the national supervision and inspection of home-grown nursery stock entering interstate commerce, and further providing for the extermination or control of imported insects or plant diseases which have only become locally established in the United States. While this program of legislation was adopted by the joint committee and was afterwards approved by the Association of Official Horticultural Inspectors, it was rejected by the Association of Nurserymen at their meeting of 1908, very largely on the ground of their objection to national legislation covering home-grown stock. The Nurserymen's Association, however, indorsed the movement for proper national legislation to prevent the importation of new insect pests on foreign-grown nursery stock. In the same year (February 3, 1908) the Wadsworth Bill of 1899 was again introduced in the Senate, this time by Mr. Flint (S. 4857), and was referred to the Committee on Finance, where it died.

It will be seen from this résumé of the efforts to secure national legislation up to the end of 1908 that the chief objects aimed at had been two, namely, (1) to provide for the inspection and control of imported nursery stock, and (2) to have national supervision and inspection of home-grown stock wherever such was to become subject to interstate shipment, and the objection on the part of the nurserymen and others had always been aimed chiefly at the second of these objects. There had been at no time any serious objection to the general proposition of protecting this country from foreign insect pests which might be accidentally introduced on nursery stock.

Following the action of the Association of Nurserymen in 1908, in refusing to entertain any further consideration of a national inspection law, the subject of a national bill was dropped by all the interests heretofore concerned in such a measure.

THE IMMEDIATE DANGER LEADING TO THE PRESENT EFFORT TO SECURE LEGISLATION

The recent effort to obtain a national quarantine law resulted from the discovery, early in 1909, that brown-tail moth nests, filled with hundreds of small hibernating larvæ, were being introduced into this country in great numbers and distributed to many states on imported European nursery stock, chiefly from northern France.

This state of affairs was repeated during the importing season of 1910. Time will not be taken to give the details of the shipments and

distribution of infested nursery stock during these years. Some idea of the situation can be gained, however, from a brief summary of importations and foreign conditions drawn largely from the annual reports of this bureau, by Dr. Howard, for the years 1909 and 1910.

Brown-tail moth nests imported in 1909.—The first discovery of nests of the brown-tail moths in foreign nursery stock was in a shipment of seedlings from Angers, France, to New York. The discovery was made and reported to this bureau by the commissioner of agriculture of that state. A little later, advices from Ohio indicated that the winter nests of the brown-tail moth had been found upon seedlings imported from the same locality in France. Warning letters were promptly sent out by Dr. Howard to the different state entomologists and a special arrangement was made through the kindness of the secretary of the treasury with the customhouses and by agreement with the railroads, so that the bureau was notified of all cases of plants received at the customs ports or handled by the principal railroad companies. By this means the receipt and ultimate destinations were ascertained of probably all the imported stock. The bureau was thus enabled to notify state inspectors and other competent persons near the points of ultimate destinations of such packages, and inspection was brought about in probably all instances in the cases of plants received after January, and also probably before that time. In all, information was secured concerning nearly 800 shipments divided among 35 different states. In shipments to 15 of these states, namely, Alabama, Georgia, Illinois, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio and Pennsylvania, nests of the brown-tail moth were found, and in one locality in Ohio a single broken egg-mass of the gypsy moth was found. These brown-tail nests, each containing four to five hundred young larvæ, were found by hundreds in these shipments, some 7,000 nests (2,800,000 larvæ) being found in the shipments to New York state alone. Prof. P. J. Parrott, of the New York Agricultural Experiment Station, at Geneva, N. Y., also found in his summer's inspection still another European fruit pest, *Hyponomeuta padella*, which had probably been introduced on these same French seedlings.

Brown-tail moth nests imported in 1910.—In the importing season of 1909 and 1910, in spite of promises on the part of French authorities to see that proper inspection should be made, the shipments of nursery stock from France again brought to this country many brown-tail moth nests. Moreover, one shipment of nursery stock from Belgium to Louisiana contained an egg cluster of the gypsy moth. All of this imported European stock was again followed up, so far as possible, by a continuation of the arrangement referred to of the previous year with

the Treasury Department and customs officers and by agreement with the railroads, and probably most of the shipments of 1910 were inspected at their destinations.

Of the shipments of 1909–10, 291 were found to be infested with nests of the brown-tail moth, and these went to the states of Colorado, Connecticut, Georgia, Illinois, Indiana, Kansas, Louisiana, Michigan, Montana, New Jersey, New York, Ohio and Virginia.

In most of these states the inspection referred to was made by state officials. In other cases, where there was no state service, inspection was carried out either by employees of the bureau or by expert collaborators appointed for the purpose.

Investigation of European nursery conditions.—During the summer of 1909, and also again in 1910, Dr. Howard, who was in Europe principally to supervise the introduction of parasites for the gypsy and brown-tail moths into Massachusetts, madė a careful inspection of the nursery regions of Holland, Belgium, and northern France and also England.

The writer was in Europe, on a personal trip, in the summer of 1909, and made an examination of similar conditions in Holland, Belgium, and parts of Germany.

Holland probably presents the cleanest bill of health in the matter of insect pests, and particularly of the gypsy and brown-tail moth. This country enjoys a good inspection service, and all Dutch nurseries are carefully inspected twice each year, so there is probably less danger now from shipments from Holland than any other country.

Belgium in 1909 was in very bad condition, and the writer found the brown-tail moth more abundant there than he had ever seen it, hedgerows often being plastered with the winter nests. The location of many of these being only a few miles from the border of Holland, is within easy flight of the moths to large Dutch nurseries. Belgium has, however, since September, 1909, established an inspection service applying only to nurseries exporting to America and limited to field examination, twice yearly, of growing stock. While a distinct improvement, the inspection as indicated is still inadequate as shown by infested stocks still coming under official certificate.

In France in 1909, Dr. Howard found no governmental inspection system of nurseries. The certificates attached to shipments of nursery stock received in this country from France were signed, as a rule, by men connected with agricultural schools, and probably in the case of most of the certificates the stock had never been seen by the expert. At least the conditions of the stock coming to this country during the last two years made it abundantly plain that these certificates were valueless.

Nursery stock for export was found, in many cases, to be grown in the vicinity of hedges and trees infested with the brown-tail moth and gypsy moth and other injurious insects not yet introduced into the United States, and no special precautions were being taken by nurserymen to prevent the infestation of this stock by injurious pests. The brown-tail moth nests are so characteristic and noticeable that it is only by mere carelessness and inattention on the part of French exporters that they are packed for shipment without removal.

As a result of the agitation of 1909, the French exporters promised to take all possible precautions, and the French ministry of agriculture promised to found a governmental inspection service, but, unfortunately, the Chamber of Deputies failed to pass the inspection law proposed by the ministry of agriculture. As already noted, the condition of the inspected material of 1909–10 was no better than in the previous year.

The director of agriculture of France, however, continued to urge the need of a plant-inspection service for export nursery stock, and early in November of this year (1910) this department was advised, through the Department of State and the ambassador of France to the United States, of the final establishment of such service. Later the details of the law were communicated to Dr. Howard by Dr. Marchal, who is charged with its execution.[1]

Dr. Marchal's high reputation gives a guaranty of thoroughness, and a great improvement may be expected in the future in the condition of the nursery stock coming from France.

In England Dr. Howard found that, as in France, there was no governmental nursery inspection. The nursery conditions there are somewhat better than in France, but the brown-tail moth and other injurious insects which might easily be imported on nursery stock, occur in England. The officials of the government board of agriculture of London, stated that the Government had the establishment of a governmental inspection service under consideration and were willing to establish such a service, but the demand for it must come from British nurserymen. An attempt was therefore made by Dr. Howard to get these interests to ask for such service, and, while no action has yet been taken, it seems probable that the English Government will move in this direction.

Significance of the importations of 1909–10.—It is scarcely necessary to comment on the tremendous danger which the importations of nursery stock of the seasons of 1908–09 and 1909–10 has for this country. The enormous cost of the gypsy and brown-tail moths in

[1] See The New French Plant Inspection Service, by Dr. L. O. Howard, Journ. Econ. Ent. 3: 499.

New England is now well known. Throughout the infested districts of New England orchards have been completely destroyed and forests obliterated, and even where woodlands and parks have been protected at enormous expense, their beauty and value have been vastly lessened.

As elsewhere indicated, the United States Government is now spending $300,000 a year in a mere attempt to check the rapidity of the distribution or dissemination of these pests, and the New England States affected are now spending more than a million dollars a year in efforts at local control. Extermination is entirely out of the question, and all these expenditures must go on indefinitely at a probably increasing rate, unless some check by natural means, such as that by parasites, can be brought about. When it is realized that these two pests have been distributed on imported nursery stock throughout 23 states during the last two years, the danger to the whole country is evident, and this danger applies to every orchard and to every nursery, and to every owner of private grounds, and also to our entire forest domain.

The actual value of the importations of nursery stock which are thus jeopardizing the entire fruit and forest interests of this country is comparatively small, although doubtless important from the standpoint of the nurseryman. It consists, for the most part, of seedling stock,—apple, pear, plum, cherry and ornamentals. The value, as declared for customs, of such importations during each of the years 1907 and 1908, of which we have tabulated records, amount to about $350,000, practically the sum which the United States Government is expending annually in endeavoring to limit the spread of the gypsy and brown-tail moths in Massachusetts, and one-third the sum which the New England States are expending annually in attempting to control these pests.

The stock of the last two years which has been most infested has come from northern France, accumulated from various smaller or larger nurseries, including a French seedling agency managed by an American corporation, composed largely of New York nurserymen. Of the stock imported from these districts, some of it, on the statement of the nurserymen, which is not to be questioned, is much better than similar stock grown in this country. This applies particularly to pears, cherries, plums and quinces. Apple seedlings, up to a few years ago, have been largely of American growth. The establishment of this French-American company and the growth of foreign importations has resulted in a great deal of such stock being now obtained from France. Mr. F. W. Watson, of Topeka, Kan., in an article in the *National Nurseryman* for January, 1910, page 437, on

"American-grown Apple Seedlings," states that from twenty to forty million of American-grown apple seedlings are used in this country every year, the production of about a dozen nursery firms. The bulk of the seed used comes from France, and therefore is of the same stock as the imported French seedlings.

Admitting the necessity for the importation of such foreign stock, it becomes all the more imperative that such stock should be subject to proper inspection and that every possible means should be taken to safeguard this country from the introduction of new plant enemies.

RENEWED EFFORTS TO SECURE NATIONAL LEGISLATION

As soon as this new danger from brown-tail and gypsy moths became known, a national quarantine inspection bill was prepared by the writer, in consultation with Dr. Howard, relating solely to imported nursery stock, with the object of meeting the immediate emergency and protecting the country from these two very serious pests, as well as to furnish future protection from other foreign insect pests and plant diseases. The main objection to the earlier bills was avoided by eliminating altogether the subject of local inspection of nurseries or supervision of widely distributed pests—a field which has been taken up efficiently in many states, and is more or less covered in all. In other words, the measure was drawn to apply solely to imported nursery stock and to new and locally established pests.

This new bill (H. R. 27367) was reported by Mr. Scott from the House Committee on Agriculture in January, 1909, was unanimously recommended by this committee, and passed the House. It was then reported from the Senate Committee on Agriculture and Forestry by Mr. Long, without amendment, and would undoubtedly have become a law in due course if objections to its passage had not been made at this time by the legislative committee of the American Nurserymen's Association. This committee came to Washington and presented to Dr. Howard and the writer their objections to certain features of the measure, and inasmuch as it seemed possible to adjust some of these objections and there was not time to effect this immediately (as any compromise would have to be again referred to the Association of Nurserymen), after consultation with Mr. Scott, the chairman of the House Committee on Agriculture, it was decided to withdraw the bill for that session and endeavor to meet the objections of the nurserymen so far as practicable without materially detracting from the value of the measure.

This bill, in important features, was the same measure now presented to Congress for action. Its chief divergence from the present bill is that it provided for inspection of imported stock at port of entry,

a proceeding which undoubtedly would give this country the greatest possible protection, and is the rule in foreign countries.[1]

The nurserymen, however, held strongly that such examination would probably result in serious injury to or loss of stock, and in view of this and the further consideration that examination at the port of entry would necessitate considerable expense for warehouses, this feature was dropped, and in its place inspection was provided for at point of destination, thus meeting the main objection of the nurserymen. Furthermore, the new bill, to enable the department to have advice in advance of the intended importation and of the date of probable arrival of nursery stock to be inspected, provided for a permit system similar to that now in force in the case of importations of domestic live stock or other animals and birds.

This revision was carried on by correspondence and included several changes wished by the nurserymen in addition to the main point of examination at final destination. Nevertheless, the nurserymen failed to give their full approval to the bill, and at their summer

---

[1]The growing fruit interests of Canada are protected from foreign pests, including those now established in this country, by comprehensive quarantine regulations, which are very strictly enforced. As a rule, these require the examination of imported stock at port of entry and before its distribution. An interesting statement, showing the feasibility of such examination at port of entry and the results of this governmental care, is given in a recent report to the Department of Commerce and Labor by Consul General George N. West, of Vancouver. (Daily Consular and Trade Report, August 30, 1910, p. 654.) Speaking of the rigid inspection of nursery stock and the development of the fruit interests of British Columbia, Mr. West, in part, says:

"The growth of the fruit industry in this province may be gauged by returns of imported nursery stock which the provincial inspector of fruit pests has recently transmitted to the government. The number of trees and plants inspected at Vancouver were as follows: During the first four months of 1910, January, 592,002; February, 103,184; March, 767,152; April, 1,255,718; total, 2,718,056. The inspector expects that the number of trees and plants to arrive during the other eight months of 1910 will bring the total up to 4,000,000.

"Every tree and plant is inspected as it passes through the station. This entails a vast amount of labor. Owing to this rigid inspection before the stock is delivered to the buyers for planting in the great Okanogan, Similikameen, East and West Kootenai, and the boundary country, there is not a trace of the San José scale or the brown-tail or gypsy moth. The equal freedom from the codling moth corroborates the statement that the nursery stock received for planting purposes is subject to most rigid inspection, as well as fruit imported from eastern Canada, United States and other countries. The importance of this fact to fruit growers can hardly be overestimated, as it enables them to guarantee the soundness of fruit to purchasers. . . . "The inspection of fruit coming into British Columbia is rigid and effectively enforced without partiality to the section in which it is grown, eastern Canadian fruit being condemned as quickly as American if it is not clean and free from

session of 1909 they suggested a modified bill.[1] This was the Scott Bill, with a good many features eliminated, which are believed to be absolutely essential to the safeguarding of the country. For example, the substitute bill proposed by the American Association of Nurserymen omitted (1) inspection in the country from which the importation is made; (2) the indication of the country or district in which the stock is grown; (3) provision making the fumigation or disinfection at the expense of the owner or consignee; (4) the provision for placing a quarantine, so far as any particular kind of plant is concerned, on any foreign district where such plant is known to be infested with a dangerous insect pest or plant disease not now in this country (section 8 of the bill now before Congress); and (5) other sections weakened by the omission of necessary certificates and of penalty for counterfeiting or wilfully altering the same.

It will be seen from these omissions that the substitute offered by the nurserymen was hardly one to meet the emergency and fully protect the country. The important objection of the nurserymen had been met in the omission of examination at port of entry, and it did not seem wise to yield on these other matters vital, in the judgment of this department, to the protection of the country and, at the same time, not necessarily imposing any hardship or restrictions on the importing nursery business.

In December, 1909, this nurserymen's bill just discussed was submitted to a number of state horticultural inspectors at their annual meeting in Boston, and, at the suggestion of the latter, two provisions were added which had been eliminated by the nurserymen, namely, that providing for a foreign certificate to accompany imported stock (section 2), and also the section empowering the Secretary of Agriculture to extend the provisions of this act to fruits, vegetables, and other plant products not specified in the act, should occasion for such action arise. A minor amendment was also inserted in the first section providing that shipments of less than 1,000 trees or other plants may be inspected at port of entry. The latter provision is an impractical one, inasmuch as it would require just as much machinery to

---

all kinds of insects and pests. Therefore, American shippers to the markets of British Columbia should see that their fruit and the packages it is shipped in are clean and free from pests of all kinds, otherwise it will be condemned and losses will occur on such unclean shipments."

This statement shows that the objection to examination at port of entry is largely theoretical, and undoubtedly a larger protection is secured to a country by this method.

[1] Nat. Nurseryman, July, 1909, p. 212.

make examination of the smaller shipments as it would to examine the entire foreign importations, and would entail a needless expense.

The important feature omitted from the original nurserymen's bill was again omitted from this compromise measure, namely, the power given the Secretary of Agriculture to quarantine against the introduction of particular plants from any foreign district where such plants are infested with insects or disease new to this country and particularly such as cannot be kept out by inspection or disinfection. Several of the minor, but nevertheless important, omissions already noted in the case of the first draft of the nurserymen's bill characterized also this substitute measure.

Inasmuch as these omissions were deemed vital defects in the measure by the authorities of the Bureaus of Entomology, Plant Industry, and the Forest Service of this department, a new bill was drawn up, embodying the amendments agreed upon between the nurserymen and this department and retaining the features believed to be necessary to safeguard the country from the introduction of new pests.

Shortly after the opening of the second session of the Sixty-first Congress, Mr. Simmons of New York, at the request of his local constituency—fruit growers and nurserymen—reintroduced the Scott Bill of the previous session (H. R. 15656, December 16, 1909). The new draft referred to in the preceding paragraph, providing for inspection at final destination, and introduction by the permit system, was submitted to Mr. Simmons, who promptly introduced it in substitution for the bill which he had already presented, and it was referred to the Committee on Agriculture and ordered printed. (H. R. 23252, March 21, 1910.)

This bill, as already indicated, had been altered to meet the demands of the nurserymen in every particular which it was felt could be done without materially affecting the usefulness of the measure. Nevertheless, the same nurserymen's committee which appeared the previous year again came to Washington and made active objection to the measure, chiefly on the score of section 8, and, as a result of this objection and the peculiar conditions of that session of Congress, which made it almost impossible to enact new legislation, this bill went over to the next session of Congress. A lengthy hearing, however, was given on this measure before the House Committee on Agriculture, participated in by representatives of the Bureau of Entomology and Plant Industry of the United States Department of Agriculture, a committee from the nurserymen's association, and a number of individuals representing horticultural and nursery interests, also the state entomologists of the states of New Jersey, West Virginia, Virginia and Maryland. All those appearing before the committee were

heartily in favor of the measure as it stood, with the exception of the nurserymen, who objected to section 8.[1]

Before the adjournment of this session of Congress, however, the bill was reintroduced by Mr. Simmons, with a few verbal corrections suggested by the House Committee on Agriculture (H. R. 26897, June 15, 1910), and is on the calendar, and will come up for action this winter.

STATUS OF OBJECTIONS TO THE BILL NOW PENDING

The imperative need of a measure of this kind is universally admitted. All of the great fruit-growing and forestry interests of this country are unanimously and heartily in favor of this bill and have been very anxious for years for legislation of this kind. A great many producing nurserymen also are in favor of the bill just as it stands.

The final objection on the part of the importing nurserymen is to section 8 of the bill, which, as already indicated, provides for the quarantining of foreign districts containing some particular insect or disease infestation on particular plant or plants and new to this country. This section is intended to apply particularly to such insects or diseases as can not be kept out of this country by inspection and disinfection, a condition which merely to state demonstrates the necessity for this section. Inasmuch as the design of the bill as a whole is to allow importations of stock from districts which are infested, for all of central Europe is infested with brown-tail moth and gypsy moth, it is patent that for these and similar pests there would be no object in quarantining any special district; but in the case of insect pests or diseases which have not yet gained a foothold in this country, it is a matter of very great importance, in view of our past experience with such pests, to give them no chance of entrance, and this can be gained only by absolutely prohibiting the importation of stock from districts where these new and dangerous insects are known to exist. Inspection is not infallible, and there is no method of fumigation which can be absolutely relied upon to be always efficient to the degree of 100 per cent. Therefore, to keep such new enemies out of our country, the only method is to prohibit the introduction of stock which is likely to bring them in. As shown later on, however, the necessity for this action will probably rarely occur, and will little affect the general importing business.

That the action of these importing nurserymen does not represent the general nursery business throughout the United States is evidenced

[1] These hearings are published under date of April 27, 1910, and give a very complete presentation of the pros and cons of the proposed bill.

by the testimony of other nurserymen before the House Committee on Agriculture and letters on file in this bureau. Furthermore, the thousands of nurserymen throughout the country have interests exactly identical with those of the fruit growers, and are just as much interested in having protection as are the former.[1]

The need of such quarantine under this section will rarely be called for on account of injurious insects, most of which can be detected by inspection or destroyed by fumigation. There may, however, arise insect dangers which will require the enforcement of this section, and it is very desirable to have the provision in the measure to meet such emergencies, as, for example, insects or their eggs or other stages within plants or seeds which can not be seen and are beyond the reach of fumigants.

In the case of plant diseases, however, this section is of vital importance, and the experts of the Bureau of Plant Industry of this department and plant pathologists generally unite in indorsing it. Professor Galloway, chief of the Bureau of Plant Industry, in a letter to Chairman Scott, of the House Committee on Agriculture, dated April 29, 1910, says:

"Section 8 is the most important part of this bill, so far as the control of fungous diseases is concerned; and I judge is much more important in this relation than in relation to insect pests. For the present, the legislation called for in this section would be directed only against the diseases known as 'potato wart' and 'white pine blister rust.' So far, potato wart is on this continent only in Newfoundland, and we want to quarantine against Newfoundland, in order particularly to protect the potato-growing sections of New England. Inspection for this disease is not practical, on account of the large quantities of potatoes which may be imported, making it physically impossible to examine each potato; and for the further reason that the early stages of the disease are difficult to detect by inspection.

"Ninety-five per cent. of all the blister rust of white pine now in this country has come from one town in Germany; we want to be able to quarantine against this town and other places where we know positively that the disease is or has recently been present. Inspection is here, again, not practicable, because the disease incubates inside the plant, and can seldom be detected until it breaks out on the surface

[1] The *National Nurseryman* of May, 1910, p. 581, in an article on the inspection bill urges, editorially, even a broader application of the principle involved in section 8, namely, that "the United States Entomologist . . . should have such authority as will permit him to exclude importations from nurseries or regions known to be infested with injurious insect pests or from nurseries flagrantly careless with reference to these enemies."

of the plant, several months, or years, after it has been received in this country.

"So if this bill were passed without section 8, it would, from the standpoint of this bureau, be of very little service against these diseases."

The objection of the nurserymen, therefore, to this section seems to be unwarranted, and the more so as the other provisions of the bill would empower the national authorities to destroy such infected stock promptly on its arrival at destination, so that the nurserymen would simply have the added expense of the original cost of the stock and of transportation. It is difficult to believe that a proper appreciation of the conditions will not lead importing nurserymen to abandon their objection to this section.

A misconception seems to have arisen in the minds of several of these importers in regard to this section, namely, the belief on their part that the power of quarantine granted by this legislation will check all importations from quarantined districts. As a matter of fact, the quarantine will apply merely to the particular plant or vegetable product which carries the danger; in other words, a quarantine against the white-pine disease would have no bearing whatever on the importation of fruit seedlings or ornamentals other than pine.

With relation to the attitude of the importing nurserymen and of the National Nurserymen's Association, it should be said that in their conferences with entomologists, fruit growers, etc., and before the House Committee on Agriculture in Washington, these interests have always expressed their desire to promote legislation to protect this country from new insect pests or plant diseases which might be accidentally introduced on nursery stock, and the objections voiced by them have been to the details of the various measures presented to Congress rather than to the general principle.[1]

In conclusion, it may be added that the same permit, inspection and quarantine system has long been the law in the case of imported live stock, representing much greater values, and has worked to the entire satisfaction of importers.

NATIONAL VERSUS STATE CONTROL

The question has arisen, and properly so, in the discussion of the need of a national inspection and quarantine law relating to plants

[1] The real attitude of importing nurserymen has been uniformly to oppose and hinder any remedial legislation, as shown in the reports of the committee to their own association and published in *The National Nurseryman*. These reports indicate very plainly that this small body of importers, represented largely by the committee referred to, is opposed, first, to any legislation whatever, and, second, if there must be legislation, to any which in their judgment at all hampers their business.

and plant products imported from foreign countries, whether such inspection and quarantine is not properly the duty of the states and need not, therefore, be undertaken by the National Government. In considering this question, the absolute essential to protection must not be lost sight of, namely, uniform and competent inspection of all imported stock in whatever state or territory it reaches its final lodgment. If it could be predicated that each state would establish and maintain a competent inspection of such stock and could always be advised of its arrival, the object aimed at, namely, protection for the whole country, might be secured without a national law. In point of fact, the interests of the states are so dissimilar that it has been impossible in the past to get the same efficiency in the case of the inspection of local nursery products, and the same condition will apply to imported stock. A few states with large fruit interests have competent officials, and inspection and quarantine are reasonably efficient. In other states, including many where the fruit interests are very considerable, the present inspection is gravely wanting in efficiency.

A careful examination of this subject was made last summer, and the officials of 37 states reported on the status of existing inspection machinery. Of these 37 states, 14 reported the service as not good, 7 as doubtful, 12 as generally good, and 4 as unqualifiedly good. It is worthy of note, however, that of the four reporting as unqualifiedly good, only one has an adequate system of inspection and control, the others being among the least protected.

Left to the states, the examination and control of imported stock would fall into about the same condition as the existing inspection and control of locally grown stock, as shown by the above statement. Any laxity or carelessness in one state would in the end vitiate all the good work of the others.

Furthermore, a good many provisions of such law would have foreign relations, namely, the requirement for a certificate to accompany the stock, and quarantining of foreign districts when such action becomes necessary, and these matters could not be properly undertaken by the several states. With national control, the whole work could be coördinated and made uniform and the largest amount of protection would undoubtedly be gained. The existing state machinery and officials would necessarily be employed in this work where available. The cost of such inspection will probably not be large, and on the present basis of importations of stock of the customs value of about $350,000 annually, it is believed that this inspection and protection can be secured at a probable annual cost of $25,000.

DR. HOWARD: It would be well to state here, while I think of it, that a species of Aleurodid, new in the United States, was imported this year from Holland.

DR. SMITH: I am afraid in our inspection work that the tendency is to confine inspection to certain lines of insects. It may be interesting to know that a shipment of hemlock from Japan was badly infested by a Tineid moth, not only new to this country, but to science. Some of the British nurserymen, particularly in Ireland, have found it desirable to have their nurseries inspected by European entomologists, and they present certificates which, while they have no official significance, show their desire for clean stock. Some of these certificates are signed by Professor Carpenter at Dublin, and some by Professor Theobald and other entomologists, and those certificates, while having no official standing, at least represent the work of conscientious men, and men of standing, and they deserve recognition, so far as certificates are recognized, until the nurserymen there are elevated to the knowledge that it is important to have clean stock.

DR. HOWARD: There was a case which came to my attention of the White Pine Blister Rust being sent from a nursery from the State of New Jersey, which the nurseryman admitted to me himself had come in a shipment from Germany.

PRESIDENT WASHBURN: Dr. Howard, in the matter of imported bulbs, what mite or mites would be apt to be found upon them?

DR. HOWARD: There is a bulb mite, at least one, which is very important. We ought to keep it out. Every bulb ought to be inspected. That question has been asked by many state entomologists and I have always replied that I think we ought to inspect bulbs.

PRESIDENT WASHBURN: Is there any chance of securing any federal funds for furthering this work in the several states?

DR. HOWARD: The bill carries an appropritation of $25,000 only.

DR. SMITH: Before the discussion closes I should like to offer this resolution: Resolved, That this Association heartily indorses the Simmons Bill in all its parts. I offer this resolution for the committee of which I am chairman. Motion seconded and carried.

MR. ATWOOD: There is hardly a block of trees in the State of New York but that some one of our inspectors knew the history of it before it was planted. We keep pretty close watch, and if a man is going to plant a new section, the surroundings are all carefully examined to see if the thing is all right. The old orchardtrees or hedges are avoided by the nurserymen. The examination of the orchard is practically an each-tree examination in an area where we know the San José scale is likely to be. The examination of a nursery would be, in case of San José scale, taken up row by row, or tree by tree if a small

nursery. You see we are not limited for time. You speak of some of the difficulties you have—does this not come from the fact that you make the nurserymen pay for their inspection?

PRESIDENT WASHBURN: They pay very little,—from $1.50 to $6. Average about $4.50.

MR. ATWOOD: I think if we insisted upon the nurserymen in New York paying for their inspection, they would not send for the inspector so often. They are afraid of the laws of other states, and do not want to ship stock and have it rejected by other states. They want to hold their trade from year to year, and they not only ask inspection of nurseries, but they ask special examination. They want the stuff to go through without any question of its being right. This leads to special fumigation. I think that entire nursery blocks in the state of New York practically have every tree inspected. Where there is no infestation the first examination would call for every third row, or skipping two rows and taking two rows, but it is in large blocks where the trouble comes. I think they will have to go deeper into it, and look out for the old plum trees and old hedgerows. Where do we get the infestation? It comes up almost out of the ground. You cannot tell where it comes from—you simply know it is there. In one instance we had a little block of 10,000 pear trees two years old destroyed because of the presence of scale. We had examined this block a great many times, and never saw any infestation, but I was going out one day and saw a scale. We spent a great deal of time the rest of that summer and found another scale or two. All of us were in there many, many hours at different times, and no scales developed there that summer, but the next year I suppose 200 trees were destroyed in that bunch. It is quite often necessary with peach stock, to get down on hands and knees and search until the trouble is found. As I remarked this morning, it was not the intention to give any nurseryman a certificate as long as there was any live scale on his stock. Since the discovery of the usefulness of lime-sulphur for the control of San José scale in orchards, very few orchards have been condemned. I think the time is coming when nurserymen will demand that their stock be treated for scale.

PRESIDENT WASHBURN: The next paper on the program is on the bulb mite. It will be read by Mr. Engle.

THE BULB MITE

(*Rhizoglyphus hyacinthi* Boisd., Syn. *Rhizoglyphus echinopus* Michael)
Also known as the "Eucharis Mite"

By Francis Windle, *Westchester, Pa.*

Although this bulb pest seems to be world wide in its distribution, and very serious in the extent of injuries to such plants, but very little attention has been given to it by American economic zoölogists, and the importers who were accustomed to seeing and throwing out large numbers of injured and diseased bulbs annually were apparently not aware of its existence, until a system of inspection in Pennsylvania, by the economic zoölogist, Prof. H. A. Surface, brought it to their attention the present year.

It is further quite evident that European growers of bulbs, if acquainted with it, have not realized its damaging nature, and have done little, if anything, to check or control it.

The first inspection was made on August 4th, and the latest on December 1st, 1910, at Philadelphia; both importations being from Japan and containing mites. During the four months intervening, samples of thousands of cases were inspected. Decayed bulbs, upon microscopic examination, showed fungus and bacteria, and some eel-worms (Nematodes). At the same time virtually all decayed bulbs, whether from soft or affected by dry rot, contained mites.

The question naturally arose what injury the mites were responsible for? Whether they simply followed decay from fungus or other cause, or whether they did direct injury. Investigations were therefore continued with this point in view. These mites were soon found in solid bulbs, and a wide scope of direct injury was discovered, from slight stains, through grating wounds from eating the scales either base or tops, to complete riddling of the entire bulb.

The bulk of the importations examined came from France, Holland and Japan, to importers in Philadelphia and vicinity. They consisted of hyacinths, narcissus, lilies and callas of numerous varieties. Some of all these bulbs, from whatever country received, were infested with the "Bulb Mite." They were also found in peony roots.

The direct injury of these mites was strikingly shown in a late importation of *Lilium brownii* from Japan by a Philadelphia seed house. In assorting them a large number had been thrown out, showing no other injury than that caused by the mites, the bases of the scales being so eaten that they would drop off from handling and the "cushion" or root crown alive with them.

There are no doubt some bulb diseases that the mites are in no way responsible for, but from my observations in these inspections, I would conclude that the mites were, in addition to their own direct injury, responsible for injurious diseases; and that fungi and bacteria were often "secondary intruders."

This conclusion is supported by George Massee of England in a recent publication. He says of the Bulb Mite—"There was at one time some difference of opinion as to whether the mite was the primary cause of injury to bulbs infested with it. It was thought that the injury might be due in the first instance to some error of treatment, and that the mites were simply feeding on the more or less decayed portions. It has, however, been definitely proved by Michael that the mites are the primary cause of injury, and that indeed they prefer sound bulbs. . . , The mites are very minute. They are yellowish white in color with just a suffusion of pink, the legs and rostrum are red."

Erwin F. Smith, pathologist of the Bureau of Plant Industry, Washington, D. C., reporting on specimens of bulbs sent him, says, after noting the presence of fungus and bacteria,—"All the bulbs, however, are badly infested with mites, . . . which very probably are responsible for the trouble, not only by direct injury, but by affording an entrance for fungi and bacteria."

Dr. Howard in his report on the same specimens says, "These mites *burrow into living healthy bulbs*, and thus give entrance to destructive diseases. They are very difficult to control, and your best plan will be to destroy the entire lot. Those which you sent are very badly infested. Importers should require mite-freedom certificates from European growers."

If we should act upon Dr. Howard's advice it would put an end to the bulb trade.

Some help might come from treating the bulbs, as by fumigation, and the growers might treat the soil, but the pest is everywhere, even in our home-grown onions,—possibly potatoes and other roots and tubers.

MR. ENGLE: I have examined a great number of foreign bulbs, and never found one consignment in which there were not mites. I would like to know what action is going to be taken regarding this bulb question. If, as suggested by Dr. Howard, these bulbs are destroyed, it will put an end to foreign importation.

PROFESSOR SUMMERS: Is it not fair to assume that this mite would prove injurious in this country, and that any action we might take now in destroying the bulbs would be simply useless? Will it not establish itself in this country anyway?

PRESIDENT WASHBURN: Have we not numbers of mites in this country which are doing the same injury?

MR. ENGLE: Doubtless we have.

PRESIDENT WASHBURN: It seems to me that bringing in imported bulbs is not making the condition worse.

MR. BURGESS: I think that the value of bulbs imported is greater than that of nursery stock, if I remember correctly the statistics on the subject.

MR. ENGLE: That is very true. I know of instances where some large importers have imported as many as 500 or 600 cases of bulbs in one importation. I am very sorry Dr. Howard is not here to let us have his views on the matter. I should like to know just what position he would take.

MR. ATWOOD: We have had a large number of shipments of bulbs this fall, and have not given it very much attention.

PRESIDENT WASHBURN: You are not inspecting bulbs now?

MR. ATWOOD: Not what we call inspection.

MR. ENGLE: I would say that we do not intend to inspect all bulbs. I asked the Secretary of Agriculture for his opinion, and he said simply keep track of the importations, occasionally examining bulbs, letting the importers know that we kept tab on them at least. It would take probably three or four months in the fall to inspect all the bulbs that come in, and probably fifty men.

(To be continued)

SYMPOSIUM ON TEACHING. The series of papers on teaching entomology contain much that is most suggestive. The discussion reflects the enormous strides made in the last generation and presages equally great advances in the next, if specialization in teaching and investigation is any criterion. We fully endorse the emphasis placed by some upon the need of a thorough general course, giving due attention to the well-recognized cultural studies as well as those more intimately related to entomological work. The foundation must be satisfactory or the integrity of the superstructure may be threatened. Let us, while urging the need of adequate courses in entomology, remember that correlated subjects should not be neglected. The teacher has an important responsibility in this respect.

The availability of insects for work in zoölogy and biology should be more generally recognized. Such instruction serves to call attention to a group altogether too frequently overlooked by the general public. Important changes in this respect have followed recent discoveries, though still further revision is necessary on the part of many before they obtain the correct perspective.

A NOTE ON THE INDIAN ENEMIES OF ALEYRODES CITRI R. & H., WITH DESCRIPTION OF A NEW SPECIES OF PROSPALTELLA

By L. O. Howard

In the course of the investigations carried on by the Bureau of Entomology of the United States Department of Agriculture of the white fly of the citrus orchards of Florida (*Aleyrodes citri* R. & H.), much attention has been paid to the question of natural enemies. This species, however, seems to be singularly free from the attacks of predatory insects, and no insect parasite in America has been discovered. There are a number of native species of Aleyrodes, and the climate and flora of California seem to be particularly suitable to the insects of this genus. Moreover, in California they are abundantly parasitized by various species of Aphelininæ and certain Proctotrypids.

In the course of the work in Florida, not only has no parasite been bred from *Aleyrodes citri*, but in spite of numerous attempts to introduce parasites of other species of Aleyrodes sent in from various parts of the United States, the agents of the bureau have not been able to induce them to oviposit in *A. citri*. The peculiar flattened form of this species and the small amount of sustenance which even a nymph would afford an internal parasite, together perhaps with some other unknown quality, seem to render it unfit for the food of native parasites.

As a result of these conditions it was deemed doubtful by the writer, and by Mr. Quaintance whose work upon the Aleyrodidæ has made him particularly conversant with this group, whether any true internal hymenopterous parasites of this species exist. Nevertheless, failing mechanical measures of control sufficiently economical in operation to appeal to the practical orange growers of Florida in the way that such measures appeal to the deciduous fruit growers of the more northern states, it was deemed advisable to make a thorough search for the original home of the white fly and for possible parasites and predatory enemies which might exist there if the locality should be found.

In consequence Congress was asked for an appropriation for this purpose, and Mr. R. S. Woglum of the Bureau of Entomology started in July, 1910, on an extended trip. His itinerary need not be described here, but it is interesting to announce that he has found *Aleyrodes citri* occurring upon citrus plants practically wherever these grow in

India. Even in localities where citrus trees grow in the jungle, apparently wild and mingled with jungle vegetation, *Aleyrodes citri* was found. Everywhere in India, however, he found that the species was under control although no artificial measures are used. Nowhere did he find trees blackened with the concomitant smut fungus, a sight which is all too common in the portions of Florida where the white fly exists. In only one instance, in the center of a thickly growing tree, did the presence of black smut indicate the presence of the white fly in at all unusual numbers.

These conditions indicated the presence either of internal insect parasites—presumably hymenopterous,—efficient predatory insect enemies or efficient fungous diseases, or all three. At Saharampur in the valley of the Ganges, not far from Delhi, he found a fungous disease which he sent to Prof. H. S. Fawcett, of the Agricultural Experiment Station at Gainesville, Fla., who has found that it is identical with the species already occurring in Florida, namely *Aegerita webberii* Fawcett. He also found in this same locality, in the Botanical Gardens, two species of Coccinellidæ which he has sent over in small numbers, but which have not as yet been received in living condition.

These Coccinellidæ have been determined by Mr. E. A. Schwarz of the Bureau of Entomology. The first one is *Verania cardoni* Weise The specific determination is certain, but there may be some doubt as to the generic position. The species belongs to the Coccinellidæ which are supposed to be aphidivorous. It seems not to be rare in India, since its name appears upon the various lists of Coccinellidæ collected in that country. The second species is supposed to be *Cryptognatha flavescens* Mots., described from Ceylon. The description is a little more than one line in length, and the determination is therefore doubtful. No species of Cryptognatha or allied genera appears upon any list of the Indian Coccinellidæ which Mr. Schwarz was able to consult. The only North American species of Cryptognatha (now separated by Casey as a different genus), *C.* (*Oeneis*) *pusilla*, is known to Mr. Schwarz to feed upon Lecanium and Aleyrodes.

At Lahore, Mr. Woglum found his first evidence of internal parasitism by hymenopterous parasites. A certain proportion of the Aleyrodes found upon orange (Mr. Quaintance has confirmed the identity of the species with *A. citri*) were found containing the exit holes of a true parasite. The specimens on leaves sent in by Mr. Woglum have been examined with great care. None of the full-grown larvæ or nymphs contained pupal parasites, but five specimens of a very minute Aphelinine of the genus Prospaltella were found dead and attached to the orange leaves in the close vicinity of the perforated Aleyrodes. The size of these specimens is such as to justify

the conclusion that they had issued from Aleyrodids, and their juxtaposition and the known habits of the genus confirm this conclusion.

The genus Prospaltella is as a rule parasitic upon Diaspine scale insects, but certain species have been bred from Aleyrodids as follows: *P. tristis* Zehnt. was reared from *Aleyrodes bergi* Sign.; *P. conjugata* Masi was reared from *Aleyrodes brassicæ* Walk.; *P. quercicola* How. was reared from *Aleyrodes gelatinosus* Ckll.; *P. citrella* How. was reared from *Aleyrodes coronatus* Quaintance, and *P. brunnea* was reared from *Aleyrodes* sp. (on climbing vine). See "A Key to the Species of Prospaltella, with Table of Hosts," etc., by L. O. Howard, Annals Entomological Society of America, Vol. I, 1908, pp. 281–284.

With the reasonable certainty that this insect is a true parasite of the Florida white fly, it becomes important to give it a name, and the following description is therefore presented.

Subfamily Aphelininæ Howard

Genus Prospaltella Ashmead, 1904.

Prospalta Howard, 1894 (preoccupied).

Prospaltella lahorensis, n. sp. *Female.*—Length, 0.54 mm.; expanse, 1.42 mm.; greatest width of forewing, 0.25 mm. Antennæ long, not clavate; scape long, slender; pedicel nearly as broad as long; first funicle joint somewhat longer than second; second and third subequal; club equal in length to second and third funicle joints together; terminal segment of club slightly longer than middle segment, basal segment again slightly shorter. Fore wings broad, with moderately long bordering cilia; disc uniformly covered with minute cilia; stigmal vein rounded below, its anterior margin for a time parallel with costa; marginal vein faintly indicated, its base joining stigmal in an acute angle. (In this respect this species differs from all other known species of its genus.) General color light yellow; all legs pallid; eyes, dark; ocelli, coral-red; antennal club dusky; wings hyaline, wing veins dusky.

Male.—Of practically the same size and structure as the female, but differing in color. The coloration closely resembles that of *Aspidiotiphagus citrinus*, to which it bears a superficial resemblance; pronotum, brownish; mesonotum, orange-yellow; metanotum and epimerum, brownish; abdomen dark brown except at base and tip where it is lighter; hind femora dusky at tips; wing veins distinctly fuscous, considerably darker than in female.

Described from two females and three males found at Washington on citrus leaves, close to specimens of *Aleyrodes citri* R. & H. containing exit holes of some parasite of this approximate size. Collected at Lahore, India, by R. S. Woglum, November, 1910.

Type No. 12169, U. S. N. M.

JOURNAL OF ECONOMIC ENTOMOLOGY

OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

FEBRUARY, 1911

The editors will thankfully receive news items and other matter likely to be of interest to subscribers. Papers will be published, so far as possible, in the order of reception. All extended contributions, at least, should be in the hands of the editor the first of the month preceding publication. Reprints may be obtained at cost. Contributors are requested to supply electrotypes for the larger illustrations so far as possible. The receipt of all papers will be acknowledged.—EDS.

The Minnesota meeting was a most successful one, and, like others in recent years, characterized by a crowded program. It is physically impossible to listen to all that might be said, even if the latter were limited to the investigations of any one year. The law of supply and demand applies here as elsewhere. Papers discussing some new principle of wide general interest, or placing on record the results of protracted investigations, are always listened to with great interest and no one begrudges spending the time necessary to a clear understanding of the problem. Another class of papers of general interest are those dealing with methods, illustrated at the recent meeting by the symposiums on teaching and spraying, both matters of vital importance and each capable of being discussed in a brief though comprehensive manner. Another very desirable class of papers adds to our knowledge of the biology, local or otherwise, of various insects, preferably injurious forms. The essentials in these latter can usually be condensed into papers of moderate length, the details being published in the JOURNAL or other serials. We agree most heartily with the secretary in holding that our gatherings should be democratic, every man enjoying equal privileges. The period which can be devoted to scientific meetings is necessarily limited, and with such a large proportion of our membership actively interested in the work of allied societies, it is almost impractical to think of extending our sessions to three days. Fortunately, the standing of an entomologist is not proportional to the time he occupies on the program, or the promise of a younger man indicated by the length of the paper he submits for consideration. Regrettable though it may be, all should recognize our time limitations, and, so far as possible, prepare papers which will give, within small compass, a comprehensive discussion of the problem. The general adoption of this plan, supplemented by our present improved facilities for publishing the details, should go far toward relieving the crowded condition of the program and allow opportunity

for thorough discussion. A congested program in Minnesota means an almost intolerable condition in this respect at Washington unless some such plan is adopted.

Adequate protection from the introduction of injurious insects is most important in these days of unexcelled transportation facilities. The danger increases very rapidly with the perfection of the latter. There are already striking cases, discussed elsewhere in this issue, where even a moderately efficient national inspection service would have resulted in enormous savings, not only in the past but also in the future, on account of pests already established in this country. Economic entomologists have taken no uncertain position upon this question, and, as officials charged with the control of injurious insects, are obligated to do all within their power to establish an efficient though not unduly onerous national quarantine service. This is most emphatically the case where the general welfare of the people as a whole should receive consideration, rather than the interests of a few. We, as a people, have already taken too large chances in this direction. It should be remembered that the gypsy and the brown-tail moth problem in Massachusetts is only the normal outcome of the sowing some twenty or thirty years ago. Such being the case, what will be the result a generation hence, unless adequate steps are taken to check this dissemination of injurious insects and dangerous plant diseases?

Reviews

Farm Friends and Farm Foes, a text book of agricultural science, by CLARENCE M. WEED (Heath & Co.) 1910, 8 vo., pages 1–334.

This little work gives in simple language and pleasing style, much information, practical and biological, concerning weeds, insects, fungi, birds and mammals. It is written by one with a large personal acquaintance with the various phases of the subject, as well as an intimate knowledge of the literature. The writer has maintained an impartial attitude and endeavored to correctly place the various organisms in relation to their environment, discussing both the injuries and benefits resulting from their activities. Written by an ardent student of natural history, well known on account of his work with insects, this volume contains much of interest to entomologists, and will appeal to a wide constituency because of the large amount of practical and reliable information.

A Neglected Field in Photo-Micrography, by S. B. DOTEN. Nevada Agricultural Experiment Station Bul. 73, 1910, pages 1–15.

This is unusual among agricultural experiment station bulletins, though very suggestive, particularly as the writer adapts a field camera to the work, and by the employment of special lenses secures most admirable results. The late Professor Slingerland was an ardent and most successful photographer of insects and others

are continuing in his steps. There have been several good papers on insect photography in recent years, and we hope to see this method of illustrating natural objects greatly extended in the near future. We should learn to use the camera rather than the printed page. This bulletin is evidently intended as a somewhat technical one, it hardly appealing to the average farmer. Nevertheless, such bulletins find a place in demonstrating new methods and indirectly may be of great service to the agriculturist.

Current Notes

Mr. A. G. Ruggles, instructor in entomology at Minnesota University, has recently been promoted to the grade of Assistant Professor.

Prof. E. F. Hitchings, State Entomologist of Maine, has been reappointed by the new administration under Governor Plaisted.

Mr. Z. P. Metcalf, Assistant Entomologist of the North Carolina Department of Agriculture, recently spent three weeks at the Ohio State University doing some research work on Homoptera.

Mr. J. B. Parker, Assistant in Entomology at the Kansas Station, has resigned to accept the chair of biology in the Catholic University at Washington, D. C.

Prof. F. L. Washburn, State Entomologist of Minnesota, gave the annual public address before the Minneapolis meeting of the Entomological Society of America on the evening of December 28.

Mr. R. W. Braucher of the Bureau of Entomology has resigned to accept a fellowship in the entomological department of Cornell University.

Mr. Francis B. Milliken has recently been appointed Assistant Entomologist at the Kansas Agricultural Experiment Station in place of Harry Evans, who resigned a short time ago.

Mr. V. I. Safro, of the Bureau of Entomology, has recently been appointed Assistant in Entomology at the Oregon College and Station.

According to *Entomological News*, Mr. J. Chester Bradley is Special Assistant Entomologist of the Georgia State Board of Entomology, Atlanta, Ga., and has undertaken a preliminary catalogue of the insects of that state.

Dr. Henry Skinner, who for twenty-one years was editor of *Entomological News*, has resigned, and the associate editor, Dr. Philip P. Calvert, has been chosen as his successor. The new associate editor is E. T. Cresson, Jr.

Mr. Henry L. Viereck, of the Bureau of Entomology, a specialist on the parasitic Hymenoptera, with headquarters at the new National Museum at Washington, has been at the Gypsy Moth Parasite Laboratory, Melrose Highlands, Mass., for several weeks, studying some of the Ichneumon parasites of the gypsy and brown-tail moths.

We regret to learn, through a recent communication from his son, that Edwyn Carlos Reed, director of the Museo de Concepcion and foreign member of our association, died November 5, in Chile.

Dr. Guy C. Crampton (Princeton, 1904), Professor of Zoölogy at Clemson College, South Carolina, has been appointed associate professor of entomology at the Massachusetts Agricultural College. He spent two years in graduate study at Cornell University (M. A.) followed by two years at the Universities of Freiburg, Munich and Berlin, where he received his Ph. D. in 1908. Dr. Crampton has studied under Professors Comstock, Riley, Slingerland and MacGillivray in entomology in this country, and with Professors Heymous, Kolbe and Degener, abroad. His work at the college, which will begin some time in April, will be mainly in insect morphology.

Mr. W. F. Fiske, of the Bureau of Entomology, and located at the Gypsy Moth Parasite Laboratory, Melrose Highlands, Mass., sailed January 5th for Europe. He expects to be absent until next fall, and will make parasite investigations in Italy, France, Russia and Japan before returning to the United States.

It has been stated in *Entomological News* that Messrs. E. A. Schwarz and A. Busck of the Bureau of Entomology were to leave for Panama some time in January to make a study of the entomological fauna of the Canal Zone, and to search for parasites of the citrus white fly *Aleyrodes citri* and the cotton boll weevil and allied species.

According to *Science*, there has been a movement on foot in the Liverpool School of Tropical Medicine to commemorate the work of Dr. J. E. Dutton, who lost his life in the Congo by contracting spirillum fever in 1905. The movement has been successful, and the School has given to Liverpool University the sum of £10,000, which has been accepted for the establishment of a chair in Tropical Entomology.

Mr. U. C. Loftin, B. S., a graduate of the class of 1910 of the North Carolina Agricultural and Mechanical College, has been appointed Laboratory Assistant in Entomology at the Florida Agricultural Experiment Station, Gainesville, Fla., and entered upon his duties December 1st, 1910. All departments of the Station, including that of entomology, are now housed in the commodious new building.

Prof. H. T. Fernald of the Massachusetts Agricultural College addressed the first annual meeting of the Massachusetts Nurserymen's Association at Horticultural Hall, Boston, December 7, on the "Problem and Progress of Nursery Inspection in Massachusetts."

Prof. F. Picard has been made Professor of Agricultural Zoölogy and Entomology at the Ecole Nationale d'Agriculture at Montpellier, France, in place of the late Prof. Valery Mayet. Professor Picard will be glad to be placed in relation with American economic entomologists and to receive their publications in exchange for his.

Mr. Harper Dean, formerly connected with the Bureau of Entomology and more recently editor of the San Antonio *Semi-Weekly Express*, has accepted the position of Assistant State Entomologist of Texas, and is now located at College Station. Mr. Dean will assist State Entomologist Wilmon Newell in the work of that office, in addition to conducting investigations for the Texas Agricultural Experiment Station.

We are advised that Prof. F. L. Washburn, St. Anthony Park, Minn., desires an assistant in laboratory, class room and insectary; also a field man properly qualified, for experimentation, demonstration to farmers, examining imported and domestic nursery stock. Good salaries to the proper parties.

Mailed February 15, 1911.